WALT DISNEY EDUCATIONAL MEDIA COMPANY

MK

mickey mouse and goofy

EXPLORE ENERGY

10

This comic book is only one part of a complete energy teaching program.

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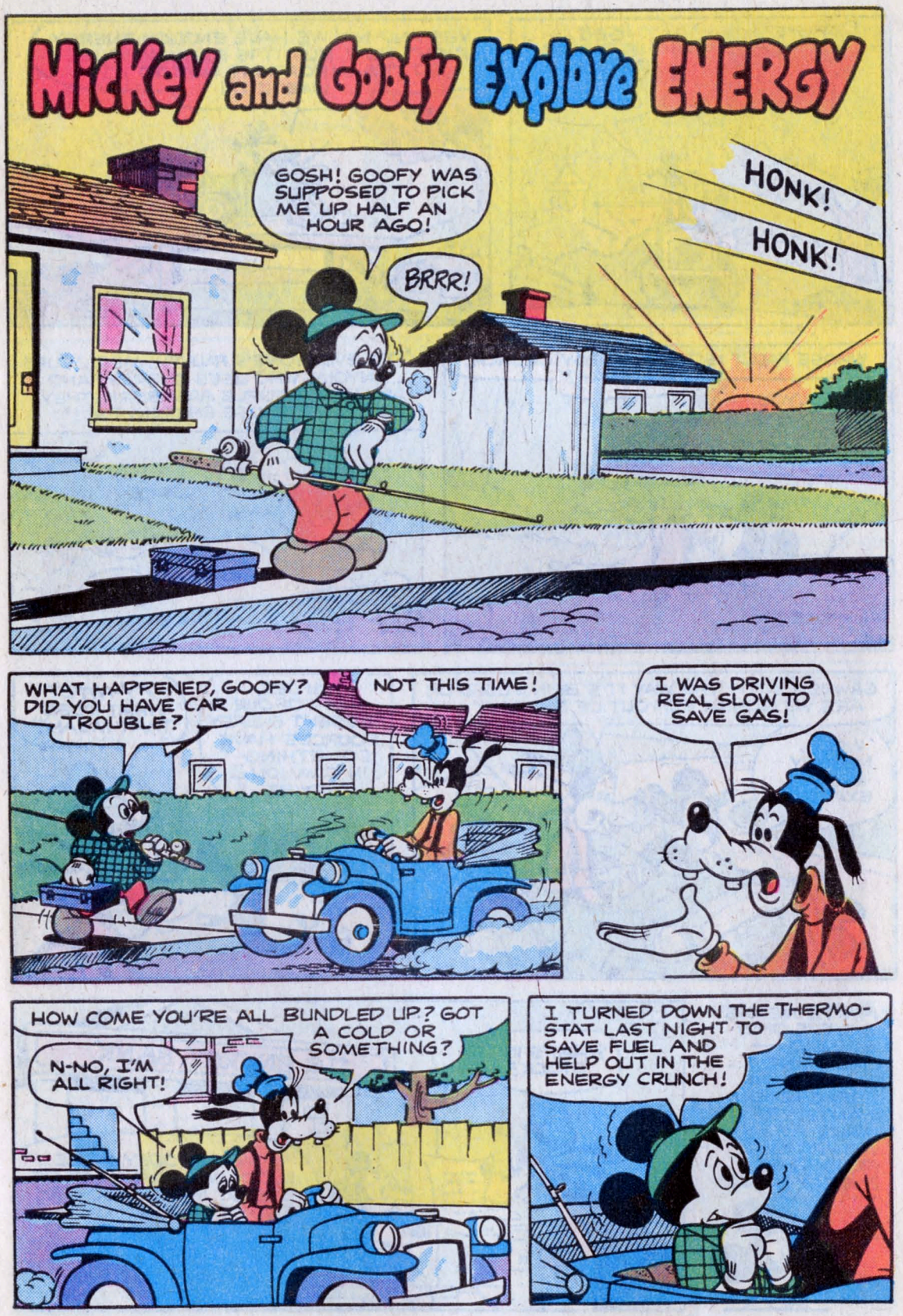
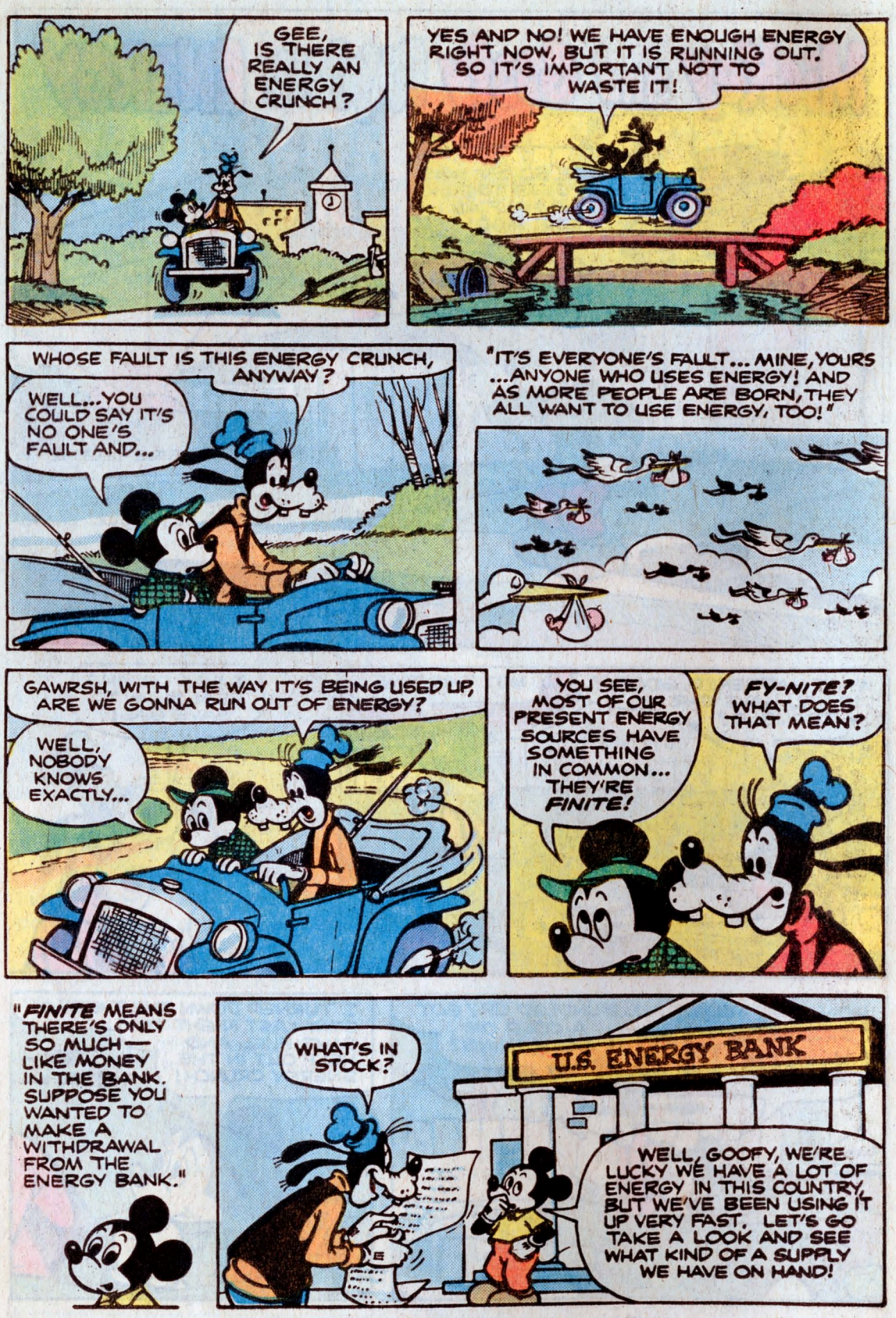
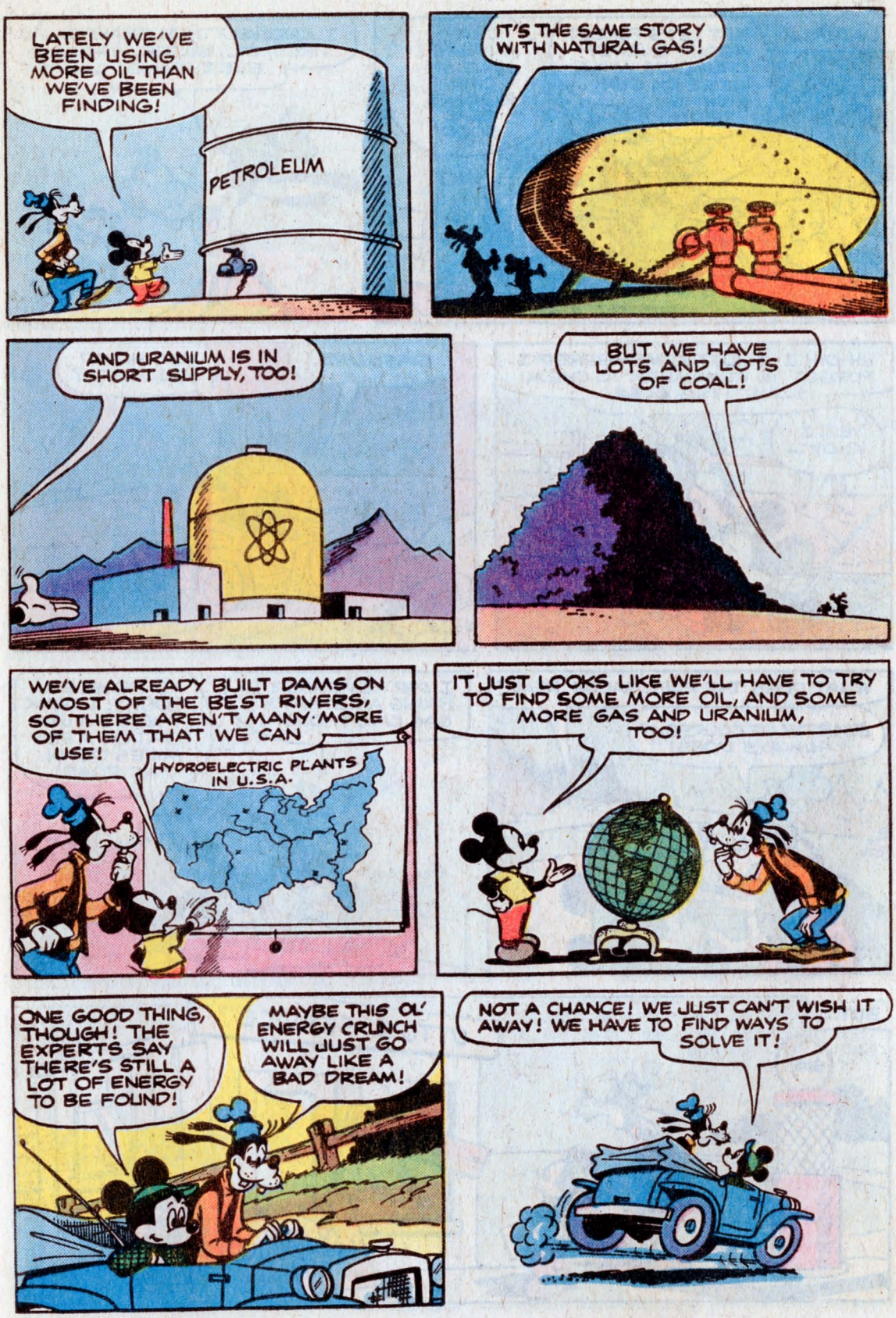
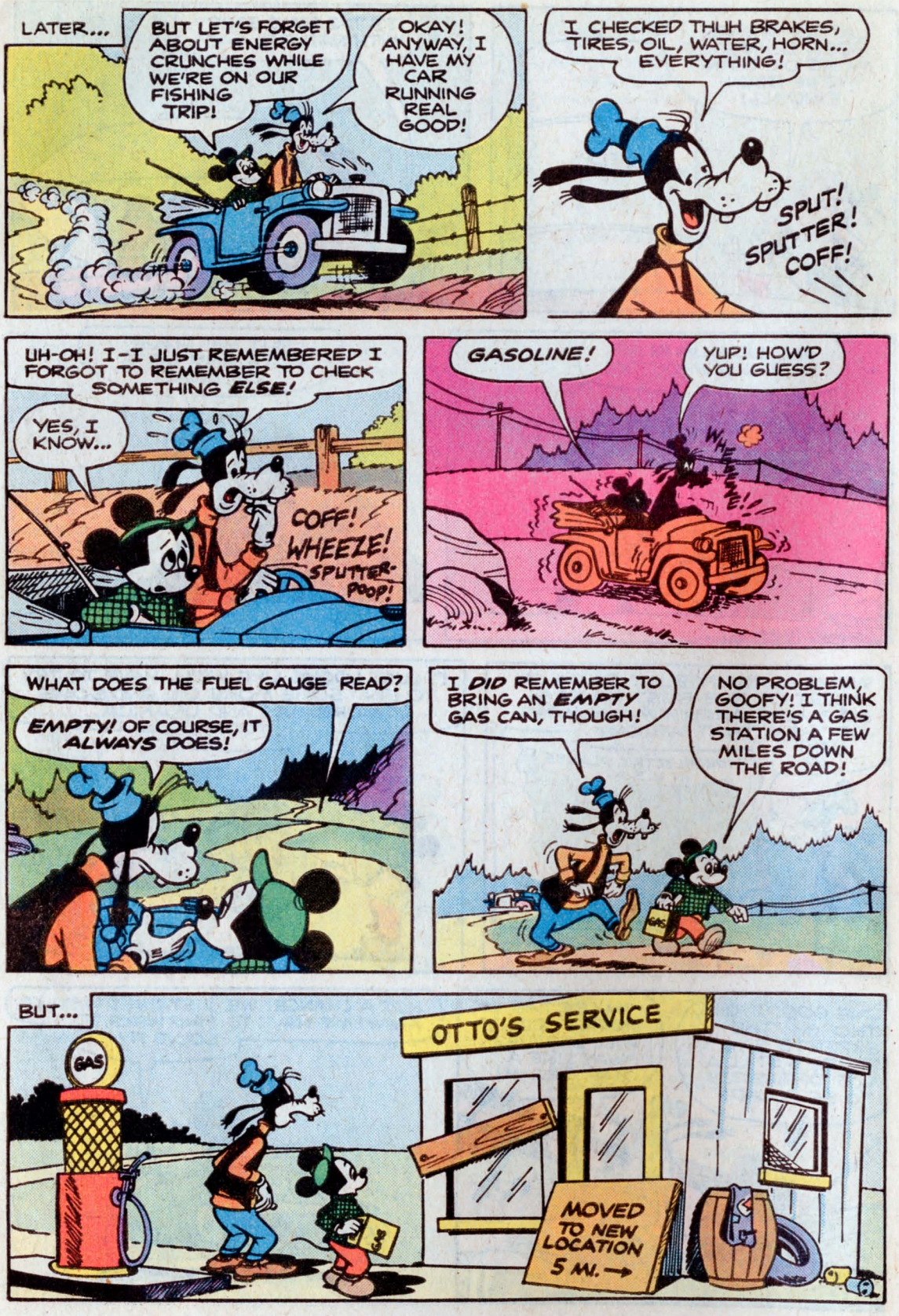
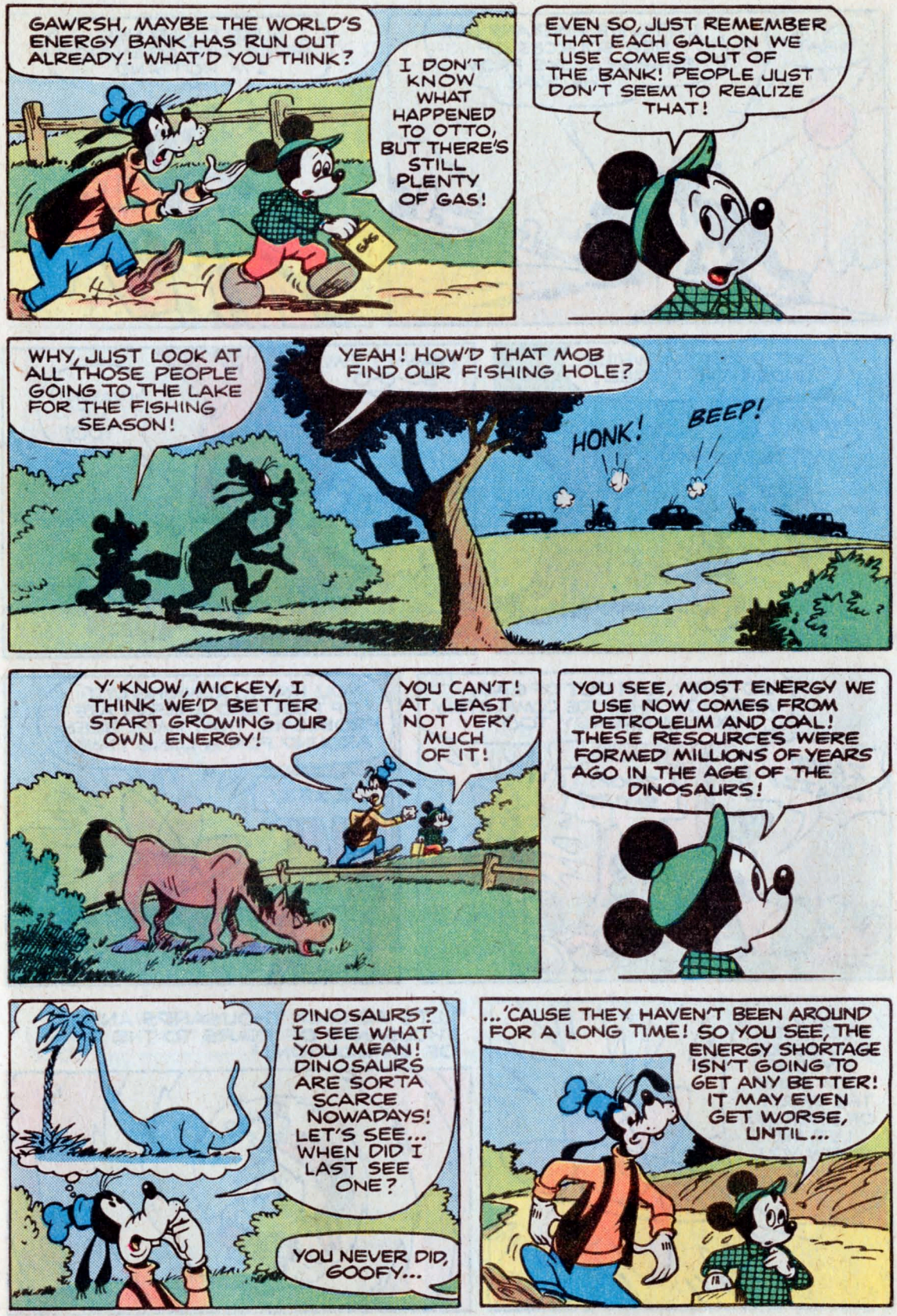
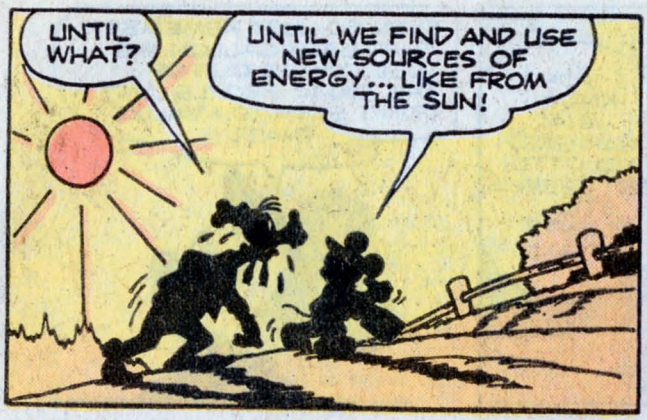

MicKey and Goofy Explore ENERGY
GOSH! GOOFY WAS SUPPOSED TO PICK ME UP HALF AN HOUR AGO!
BRRR!
HONK!
HONK!
WHAT HAPPENED, GOOFY? DID YOU HAVE CAR TROUBLE?
NOT THIS TIME!
I WAS DRIVING REAL SLOW TO SAVE GAS!
HOW COME YOU'RE ALL BUNDLED UP? GOT A COLD OR SOMETHING?
N-NO, I'M ALL RIGHT!
I TURNED DOWN THE THERMO-STAT LAST NIGHT TO SAVE FUEL AND HELP OUT IN THE ENERGY CRUNCH!


GEE, IS THERE REALLY AN ENERGY CRUNCH?
YES AND NO! WE HAVE ENOUGH ENERGY RIGHT NOW, BUT IT IS RUNNING OUT. SO IT'S IMPORTANT NOT TO WASTE IT!
WHOSE FAULT IS THIS ENERGY CRUNCH, ANYWAY?
WELL...YOU COULD SAY IT'S NO ONE'S FAULT AND...
"IT'S EVERYONE'S FAULT... MINE, YOURS ...ANYONE WHO USES ENERGY! AND AS MORE PEOPLE ARE BORN, THEY ALL WANT TO USE ENERGY, TOO!"
GAWRSH, WITH THE WAY IT'S BEING USED UP, ARE WE GONNA RUN OUT OF ENERGY?
WELL, NOBODY KNOWS EXACTLY...
YOU SEE, MOST OF OUR PRESENT ENERGY SOURCES HAVE SOMETHING IN COMMON... THEY'RE FINITE!
FY-NITE? WHAT DOES THAT MEAN?
"FINITE MEANS THERE'S ONLY SO MUCH— LIKE MONEY IN THE BANK. SUPPOSE YOU WANTED TO MAKE A WITHDRAWAL FROM THE ENERGY BANK."
WHAT'S IN STOCK?
U.S. ENERGY BANK
WELL, GOOFY, WE'RE LUCKY WE HAVE A LOT OF ENERGY IN THIS COUNTRY, BUT WE'VE BEEN USING IT UP VERY FAST. LET'S GO TAKE A LOOK AND SEE WHAT KIND OF A SUPPLY WE HAVE ON HAND!


LATELY WE'VE BEEN USING MORE OIL THAN WE'VE BEEN FINDING!
PETROLEUM
IT'S THE SAME STORY WITH NATURAL GAS!
AND URANIUM IS IN SHORT SUPPLY, TOO!
BUT WE HAVE LOTS AND LOTS OF COAL!
WE'VE ALREADY BUILT DAMS ON MOST OF THE BEST RIVERS, SO THERE AREN'T MANY MORE OF THEM THAT WE CAN USE!
HYDROELECTRIC PLANTS IN U.S.A.
IT JUST LOOKS LIKE WE'LL HAVE TO TRY TO FIND SOME MORE OIL, AND SOME MORE GAS AND URANIUM, TOO!
ONE GOOD THING, THOUGH! THE EXPERTS SAY THERE'S STILL A LOT OF ENERGY TO BE FOUND!
MAYBE THIS OL' ENERGY CRUNCH WILL JUST GO AWAY LIKE A BAD DREAM!
NOT A CHANCE! WE JUST CAN'T WISH IT AWAY! WE HAVE TO FIND WAYS TO SOLVE IT!

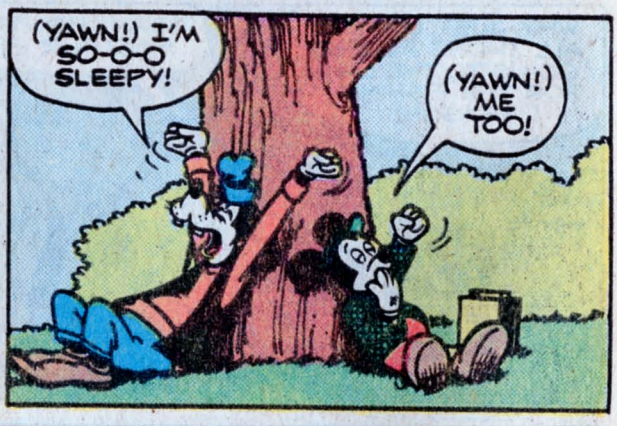

LATER...
BUT LET'S FORGET ABOUT ENERGY CRUNCHES WHILE WE'RE ON OUR FISHING TRIP!
OKAY! ANYWAY, I HAVE MY CAR RUNNING REAL GOOD!
I CHECKED THUH BRAKES, TIRES, OIL, WATER, HORN... EVERYTHING!
SPUT! SPUTTER! COFF!
UH-OH! I-I JUST REMEMBERED I FORGOT TO REMEMBER TO CHECK SOMETHING ELSE!
YES, I KNOW...
COFF! WHEEZE! SPUTTER-POOP!
GASOLINE!
YUP! HOW'D YOU GUESS?
WHEEZE!
WHAT DOES THE FUEL GAUGE READ?
EMPTY! OF COURSE, IT ALWAYS DOES!
I DID REMEMBER TO BRING AN EMPTY GAS CAN, THOUGH!
NO PROBLEM, GOOFY! I THINK THERE'S A GAS STATION A FEW MILES DOWN THE ROAD!
BUT...
GAS
OTTO'S SERVICE
MOVED TO NEW LOCATION 5 MI. →

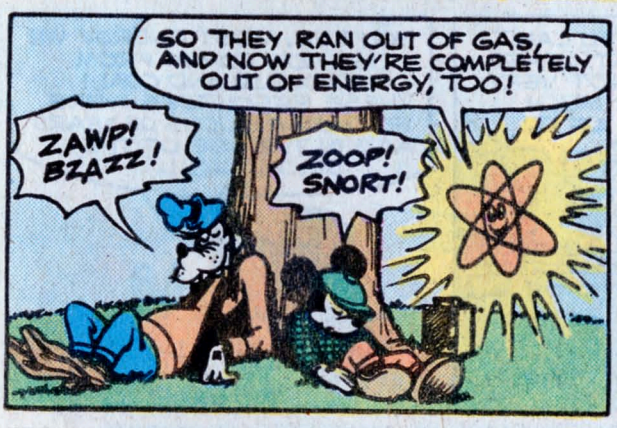

GAWRSH, MAYBE THE WORLD'S ENERGY BANK HAS RUN OUT ALREADY! WHAT'D YOU THINK?
I DON'T KNOW WHAT HAPPENED TO OTTO, BUT THERE'S STILL PLENTY OF GAS!
EVEN SO, JUST REMEMBER THAT EACH GALLON WE USE COMES OUT OF THE BANK! PEOPLE JUST DON'T SEEM TO REALIZE THAT!
WHY, JUST LOOK AT ALL THOSE PEOPLE GOING TO THE LAKE FOR THE FISHING SEASON!
YEAH! HOW'D THAT MOB FIND OUR FISHING HOLE?
HONK!
BEEP!
Y'KNOW, MICKEY, I THINK WE'D BETTER START GROWING OUR OWN ENERGY!
YOU CAN'T! AT LEAST NOT VERY MUCH OF IT!
YOU SEE, MOST ENERGY WE USE NOW COMES FROM PETROLEUM AND COAL! THESE RESOURCES WERE FORMED MILLIONS OF YEARS AGO IN THE AGE OF THE DINOSAURS!
DINOSAURS? I SEE WHAT YOU MEAN! DINOSAURS ARE SORTA SCARCE NOWADAYS! LET'S SEE... WHEN DID I LAST SEE ONE?
YOU NEVER DID, GOOFY...
...'CAUSE THEY HAVEN'T BEEN AROUND FOR A LONG TIME! SO YOU SEE, THE ENERGY SHORTAGE ISN'T GOING TO GET ANY BETTER! IT MAY EVEN GET WORSE, UNTIL...


UNTIL WHAT?
UNTIL WE FIND AND USE NEW SOURCES OF ENERGY... LIKE FROM THE SUN!

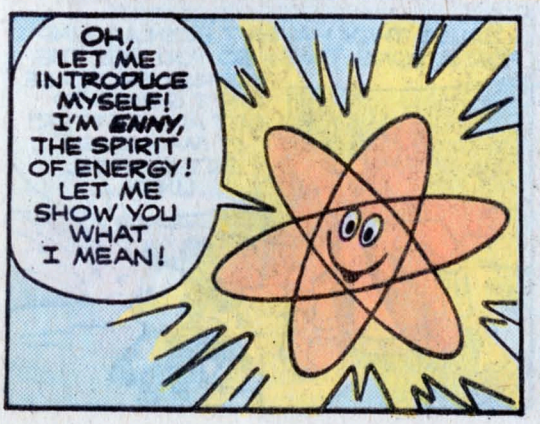
I SURE COULD USE SOME KIND OF ENERGY! I'M HOT AND TIRED!

LET'S REST A WHILE UNDER THAT TREE!
(YAWN!)

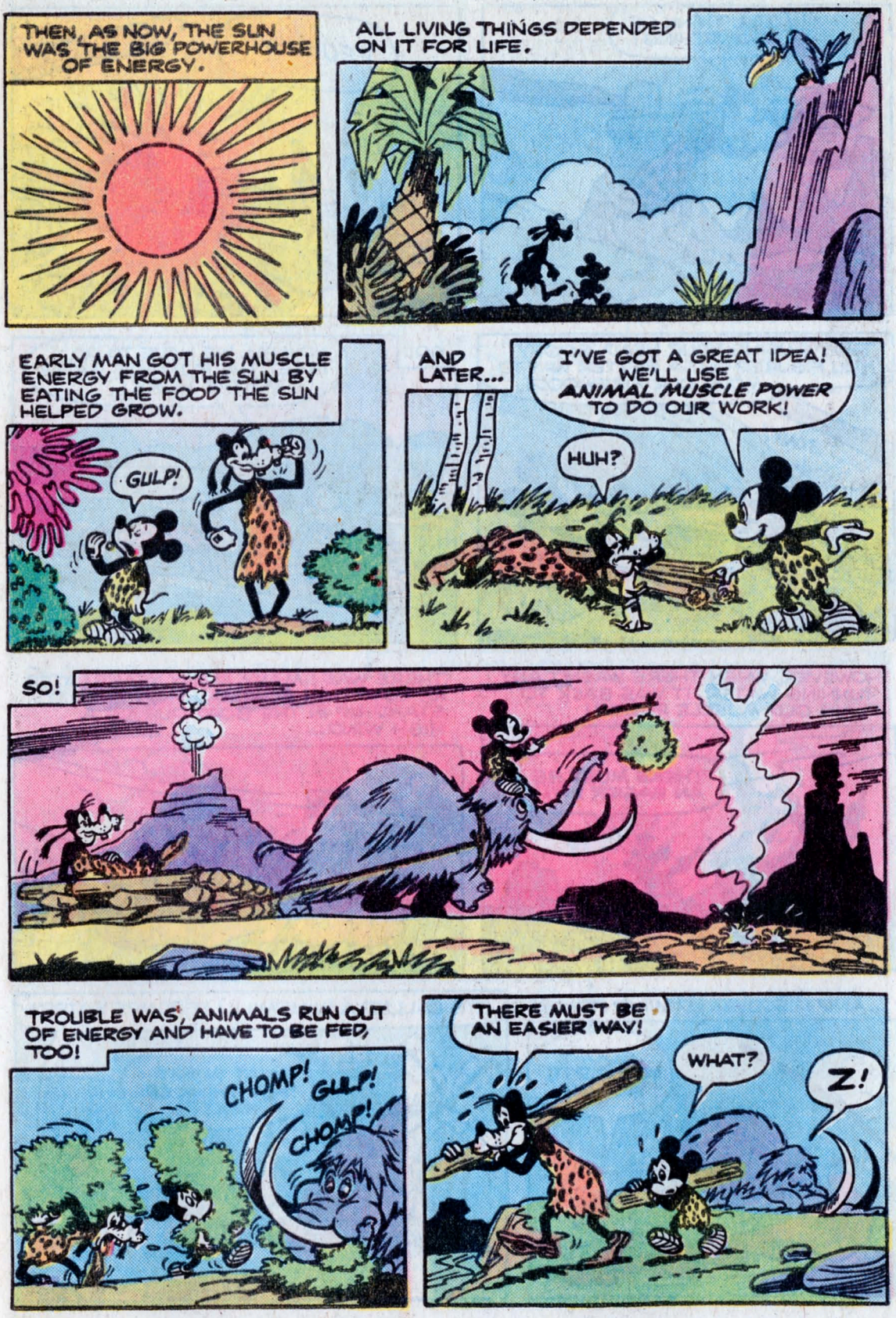

(YAWN!) I'M SO-O-O SLEEPY!
(YAWN!) ME TOO!


SO THEY RAN OUT OF GAS, AND NOW THEY'RE COMPLETELY OUT OF ENERGY, TOO!
ZAWP! BZAZZ!
ZOOP! SNORT!

YOU KNOW, RUNNING OUT OF FUEL AND ENERGY ARE PROBLEMS THAT HAVE BEEN AROUND FOR A LONG TIME!
ZZzzz!


OH, LET ME INTRODUCE MYSELF! I'M ENNY, THE SPIRIT OF ENERGY! LET ME SHOW YOU WHAT I MEAN!

"LET'S GO BACK THOUSANDS AND THOUSANDS OF YEARS TO THE DAWN OF CIVILIZATION!"


THEN, AS NOW, THE SUN WAS THE BIG POWERHOUSE OF ENERGY.
ALL LIVING THINGS DEPENDED ON IT FOR LIFE.
EARLY MAN GOT HIS MUSCLE ENERGY FROM THE SUN BY EATING THE FOOD THE SUN HELPED GROW.
GULP!
AND LATER...
I'VE GOT A GREAT IDEA! WE'LL USE ANIMAL MUSCLE POWER TO DO OUR WORK!
HUH?
SO!
TROUBLE WAS, ANIMALS RUN OUT OF ENERGY AND HAVE TO BE FED, TOO!
CHOMP!
GULP!
CHOMP!
THERE MUST BE AN EASIER WAY!
WHAT?
Z!

I'LL THINK OF SOMETHING!

YEOWWW!!

THAT'S USING YOUR HEAD, GOOFY! YOU FIGURED OUT A BETTER WAY TO MOVE OUR FIREWOOD!
BONK!

SO!
NOW ALL WE HAVE TO DO IS LET THE RUNNING WATER DO THE WORK!

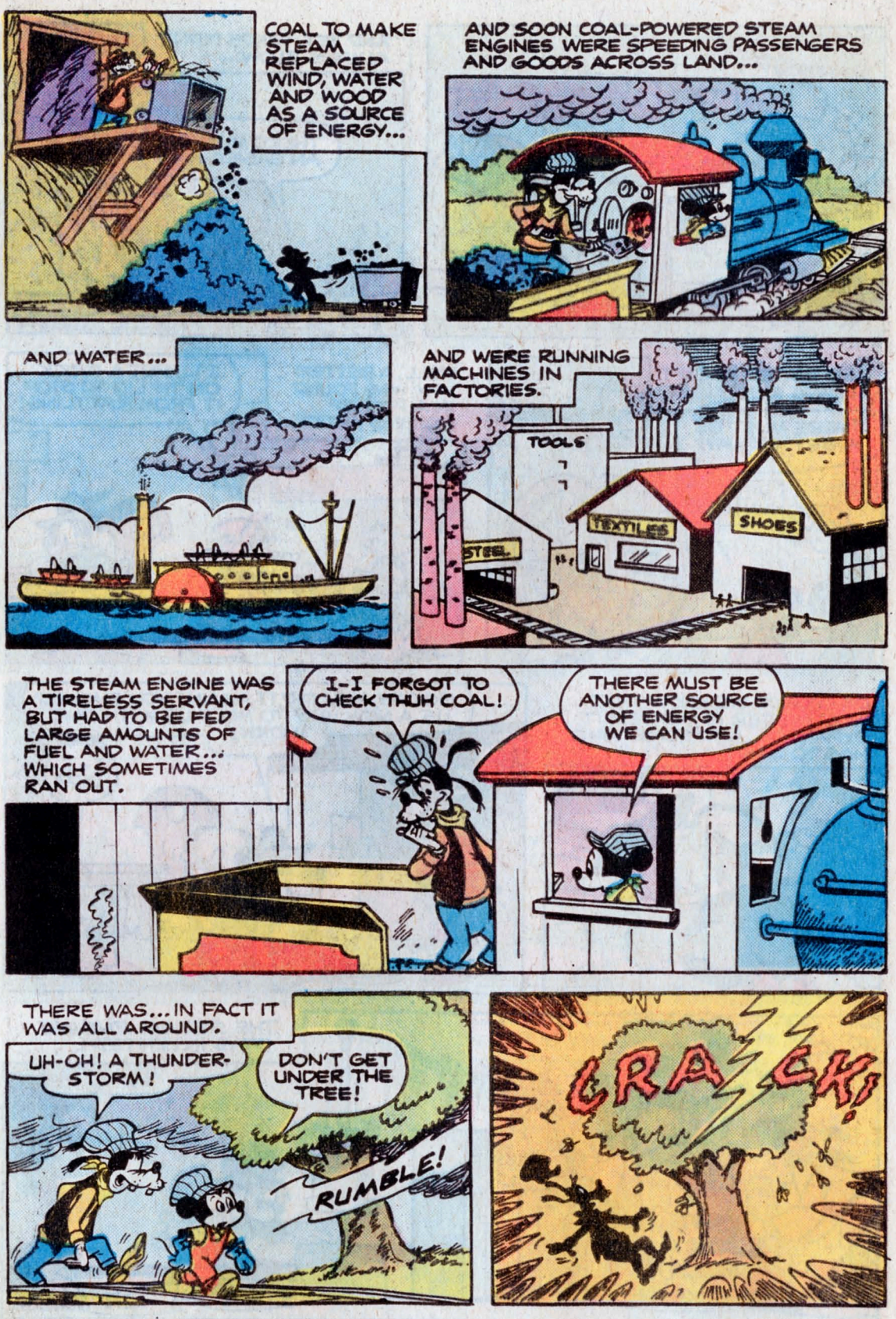
HOWEVER, WHEN THERE WASN'T ANY RUNNING WATER, IT WAS BACK TO PLAIN OLD MUSCLE POWER!
THERE MUST BE AN EASIER WAY!

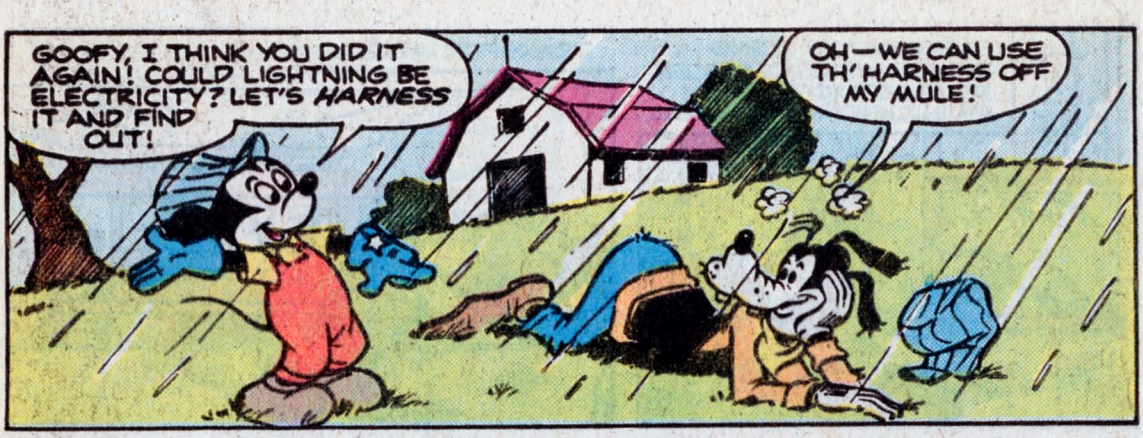
THERE WAS! MANY, MANY YEARS LATER AN EGYPTIAN BOATMAN HAPPENED TO STAND UP IN THE BOAT DURING A HIGH WIND...

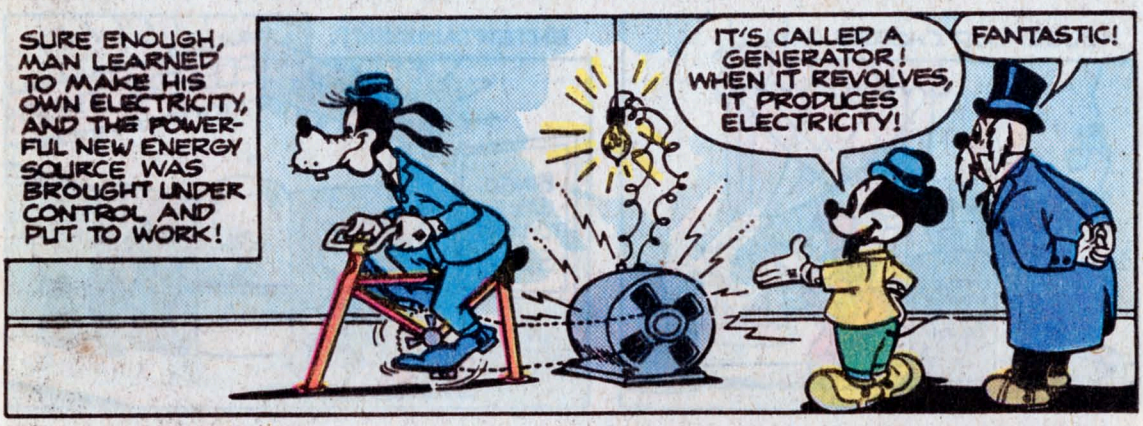
...AND DISCOVERED WIND POWER!
GOOFY, YOU DID IT, AGAIN!

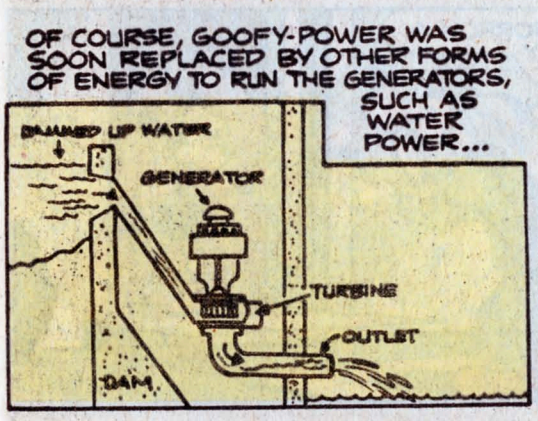
IT'S CALLED A WINDMILL! IT PUMPS WATER!
WHAT WON'T THEY THINK OF NEXT?

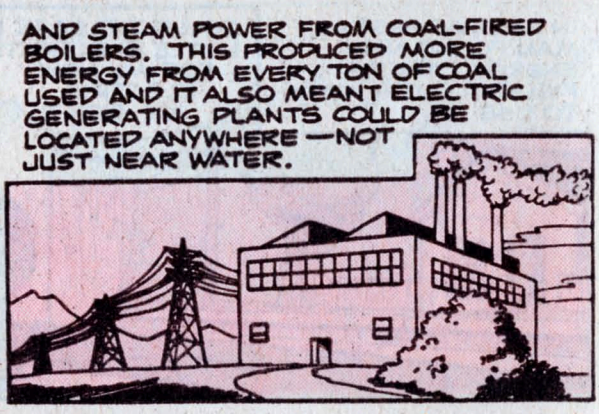
SCRATCH!
SCRATCH!
AND YET, WINDS DIDN'T ALWAYS BLOW...
THERE MUST BE AN EASIER WAY!
AND WATER WASN'T ALWAYS RUNNING!
THERE MUST BE A BETTER WAY!
MILL CLOSED
WELL, A BETTER WAY WAS FOUND IN A POT OF BOILING WATER...
I'LL PUT A BRICK ON TH' LID TO STOP IT FROM RATTLING!
RATTLE! CLANK!
OF COURSE, WE KNOW THAT WHEN WATER IS HEATED, IT EXPANDS ... AND SOMETHING HAS TO GIVE!
GOOFY, YOU DID IT AGAIN! YOU SHOWED US A NEW WAY TO HELP US WITH OUR WORK!
I-I DID?
THE STEAM ENGINE WAS INVENTED!
UNCRACKED NUTS
CRACKED NUTS

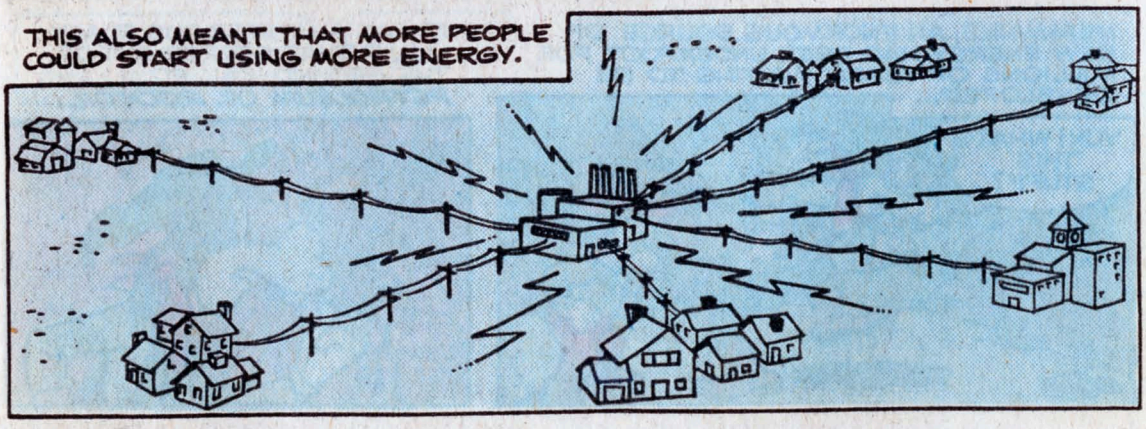

COAL TO MAKE STEAM REPLACED WIND, WATER AND WOOD AS A SOURCE OF ENERGY...
AND SOON COAL-POWERED STEAM ENGINES WERE SPEEDING PASSENGERS AND GOODS ACROSS LAND...
AND WATER...
AND WERE RUNNING MACHINES IN FACTORIES.
TOOLS
TEXTILES
SHOES
STEEL
THE STEAM ENGINE WAS A TIRELESS SERVANT, BUT HAD TO BE FED LARGE AMOUNTS OF FUEL AND WATER... WHICH SOMETIMES RAN OUT.
I-I FORGOT TO CHECK THUH COAL!
THERE MUST BE ANOTHER SOURCE OF ENERGY WE CAN USE!
THERE WAS... IN FACT IT WAS ALL AROUND.
UH-OH! A THUNDER-STORM!
DON'T GET UNDER THE TREE!
RUMBLE!
CRACK!

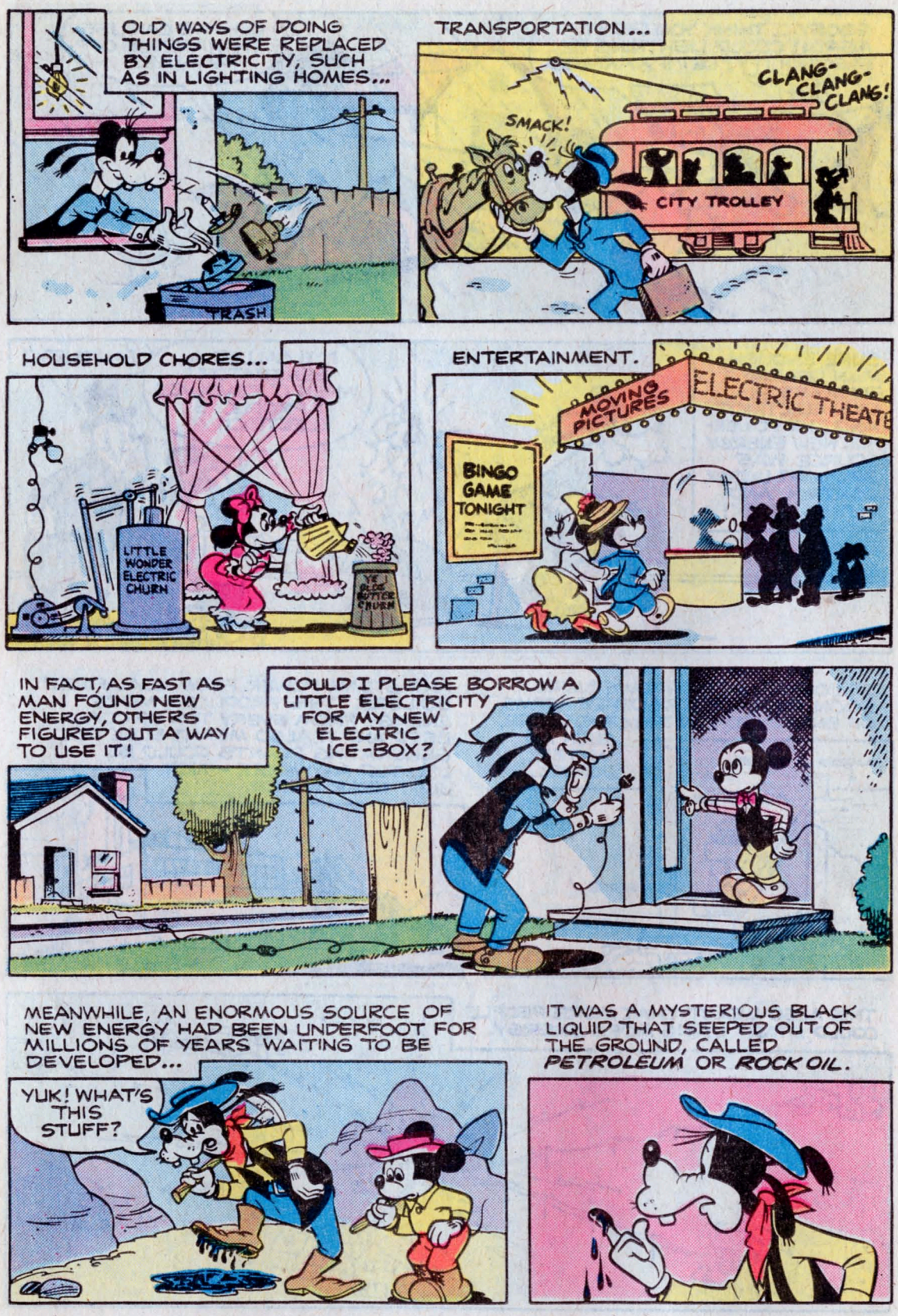

GOOFY, I THINK YOU DID IT AGAIN! COULD LIGHTNING BE ELECTRICITY? LET'S HARNESS IT AND FIND OUT!
OH—WE CAN USE TH' HARNESS OFF MY MULE!


SURE ENOUGH, MAN LEARNED TO MAKE HIS OWN ELECTRICITY, AND THE POWERFUL NEW ENERGY SOURCE WAS BROUGHT UNDER CONTROL AND PUT TO WORK!
IT'S CALLED A GENERATOR! WHEN IT REVOLVES, IT PRODUCES ELECTRICITY!
FANTASTIC!


OF COURSE, GOOFY-POWER WAS SOON REPLACED BY OTHER FORMS OF ENERGY TO RUN THE GENERATORS, SUCH AS WATER POWER...
DAMMED UP WATER
GENERATOR
TURBINE
OUTLET
DAM

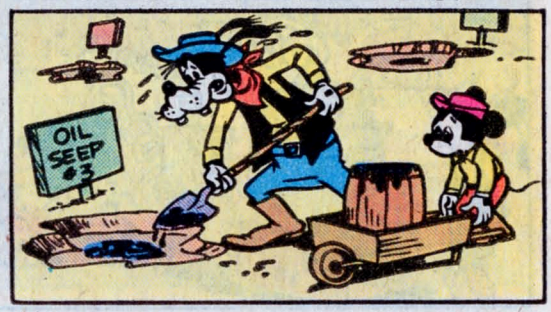

AND STEAM POWER FROM COAL-FIRED BOILERS. THIS PRODUCED MORE ENERGY FROM EVERY TON OF COAL USED AND IT ALSO MEANT ELECTRIC GENERATING PLANTS COULD BE LOCATED ANYWHERE—NOT JUST NEAR WATER.


THIS ALSO MEANT THAT MORE PEOPLE COULD START USING MORE ENERGY.


OLD WAYS OF DOING THINGS WERE REPLACED BY ELECTRICITY, SUCH AS IN LIGHTING HOMES...
TRASH
TRANSPORTATION...
CLANG-CLANG-CLANG!
SMACK!
CITY TROLLEY
HOUSEHOLD CHORES...
LITTLE WONDER ELECTRIC CHURN
YE OLDE BUTTER CHURN
ENTERTAINMENT.
MOVING PICTURES
ELECTRIC THEATE
BINGO GAME TONIGHT
IN FACT, AS FAST AS MAN FOUND NEW ENERGY, OTHERS FIGURED OUT A WAY TO USE IT!
COULD I PLEASE BORROW A LITTLE ELECTRICITY FOR MY NEW ELECTRIC ICE-BOX?
MEANWHILE, AN ENORMOUS SOURCE OF NEW ENERGY HAD BEEN UNDERFOOT FOR MILLIONS OF YEARS WAITING TO BE DEVELOPED...
YUK! WHAT'S THIS STUFF?
IT WAS A MYSTERIOUS BLACK LIQUID THAT SEEPED OUT OF THE GROUND, CALLED PETROLEUM OR ROCK OIL.

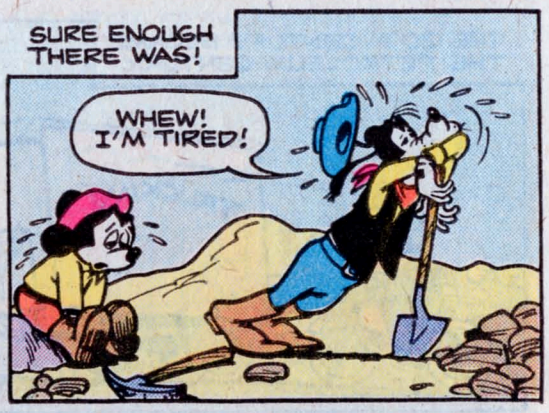
PETROLEUM WAS FIRST USED FOR MEDICINAL PURPOSES.

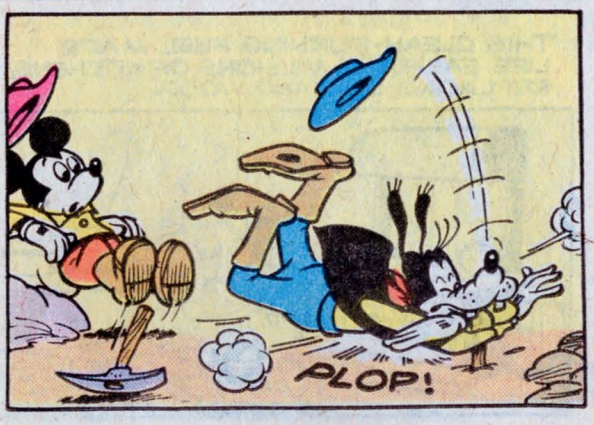
PRETTY SOON THEY THOUGHT UP OTHER USES... BUT THE WAY THEY GOT OIL OUT OF THE GROUND TOOK LOTS OF MANPOWER AND ENERGY.

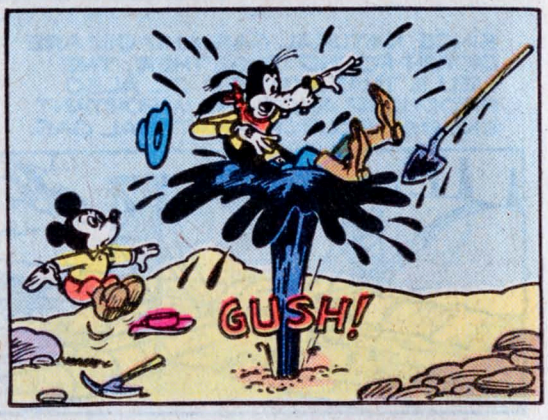


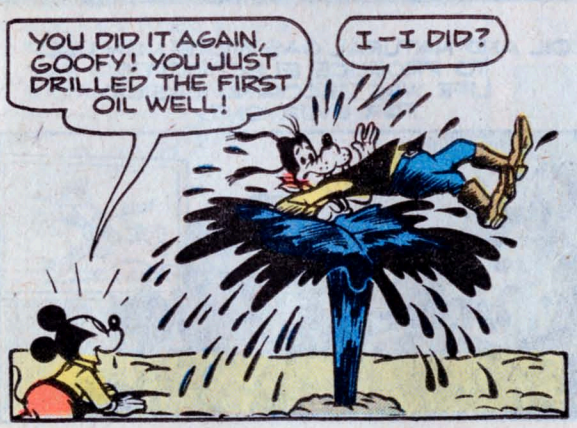
OBVIOUSLY THERE HAD TO BE A BETTER WAY TO GET MORE OIL — FASTER!

SURE ENOUGH THERE WAS!

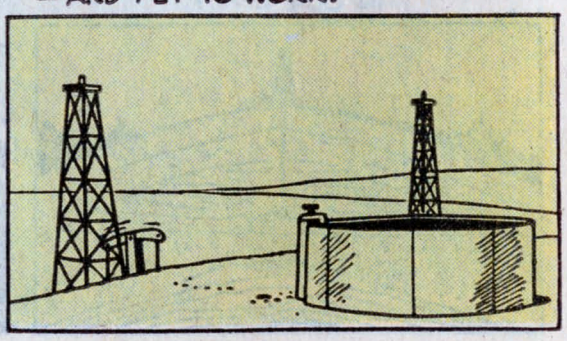




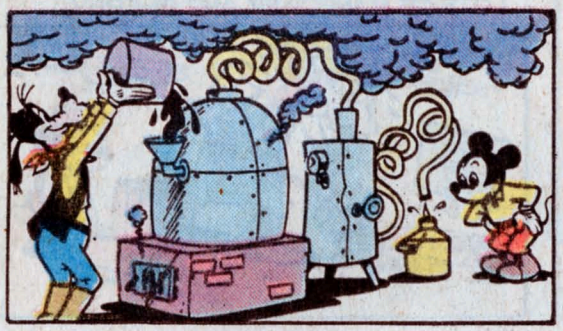




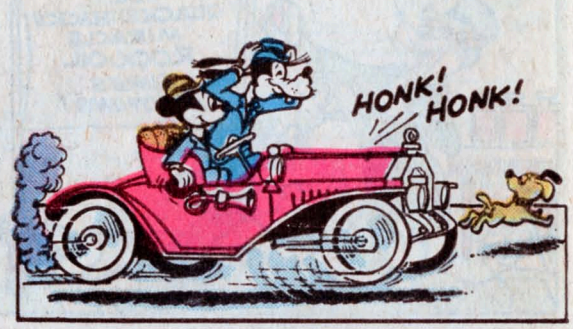
BY DRILLING DEEP INTO THE EARTH, LOTS OF NEW OIL COULD BE TAPPED — AND PUT TO WORK.



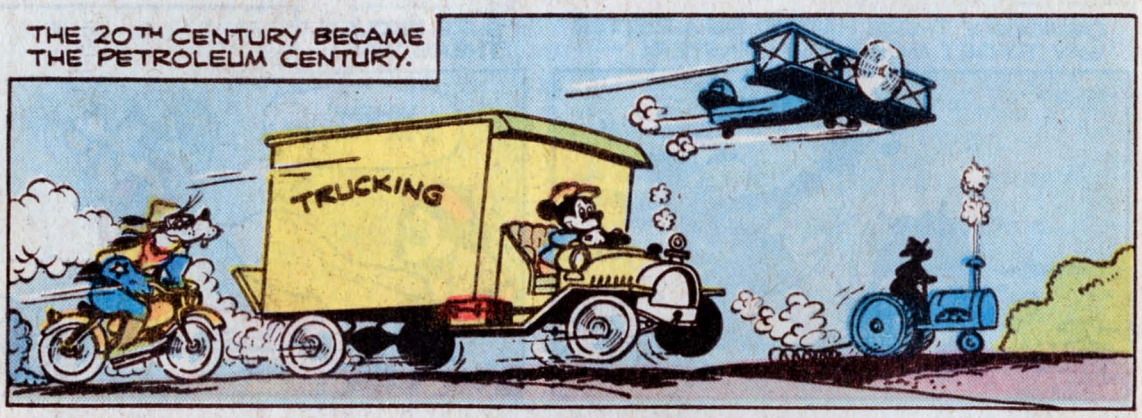
AND THEN THEY MADE NEW FUELS OUT OF IT — KEROSENE AND GASOLINE — TO DO WORK LIKE...



...RUNNING THE GASOLINE-POWERED INTERNAL COMBUSTION ENGINE.

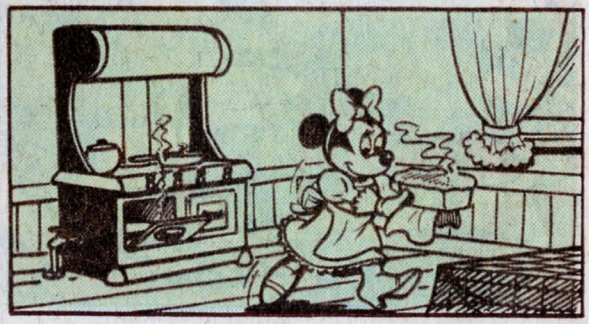


THE 20TH CENTURY BECAME THE PETROLEUM CENTURY.

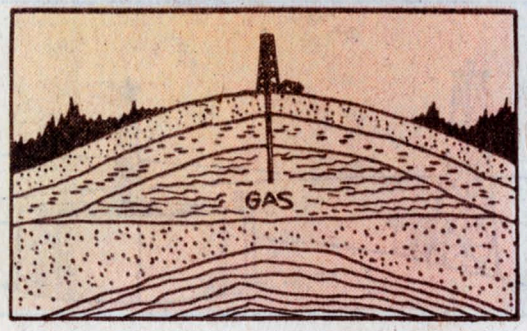


SINCE NATURAL GAS AND OIL ARE OFTEN FOUND TOGETHER, THE WELLS THAT PUMPED OIL ALSO PRODUCED ANOTHER IMPORTANT ENERGY SOURCE — NATURAL GAS.

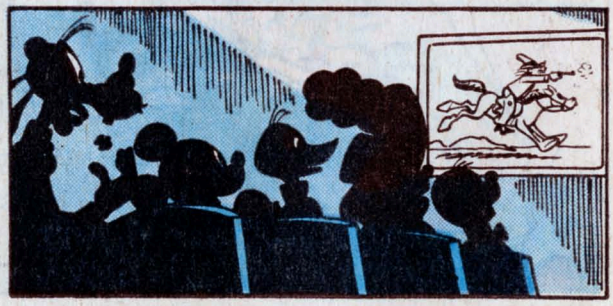
THIS CLEAN-BURNING FUEL MADE LIFE EASIER IN MILLIONS OF KITCHENS, REPLACING COAL AND WOOD.



NATURAL GAS BECAME MORE AND MORE IMPORTANT IN OUR LIVES.

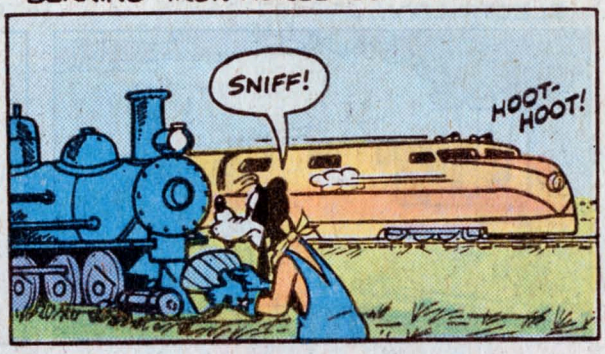


OIL AND NATURAL GAS WERE NOW USED TO PRODUCE ELECTRICITY. LIFE WAS BECOMING EASIER FOR EVERYONE.

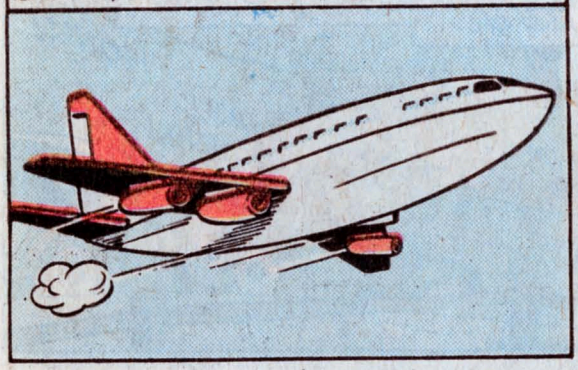


OIL REPLACED COAL TO RUN THE SHIPS OF THE WORLD.

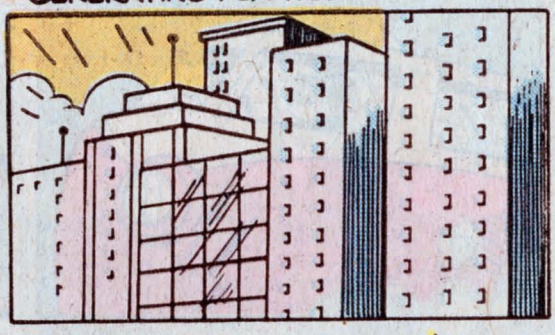
DIESEL LOCOMOTIVES PUT THE OLD COAL-BURNING "IRON HORSE" OUT TO PASTURE.



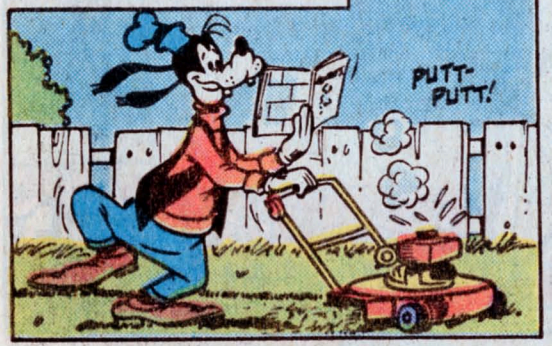
BIGGER, FASTER PLANES NEEDED MORE OIL!



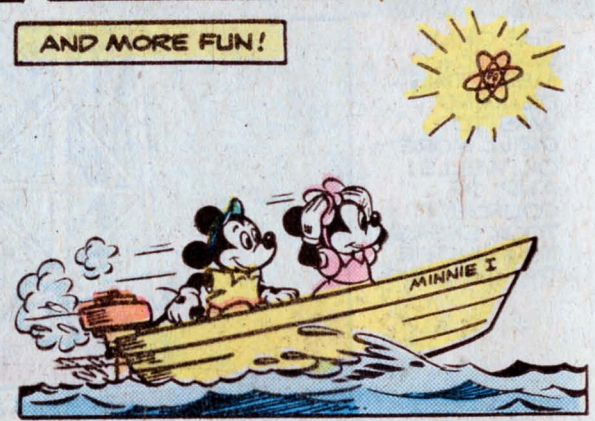
BIG CITIES GREW BIGGER USING ELECTRICITY FROM THE OIL-POWERED GENERATING PLANTS.



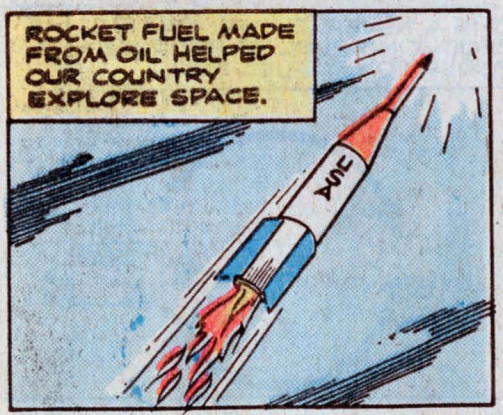
GASOLINE-POWERED GADGETS MADE LIFE EASIER...



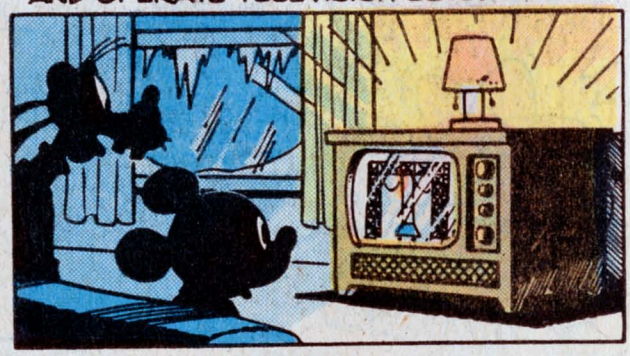
AND MORE FUN!



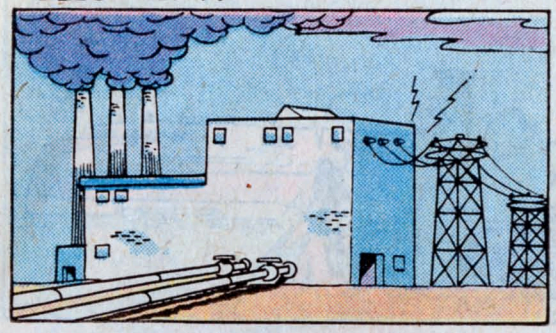
ROCKET FUEL MADE FROM OIL HELPED OUR COUNTRY EXPLORE SPACE.



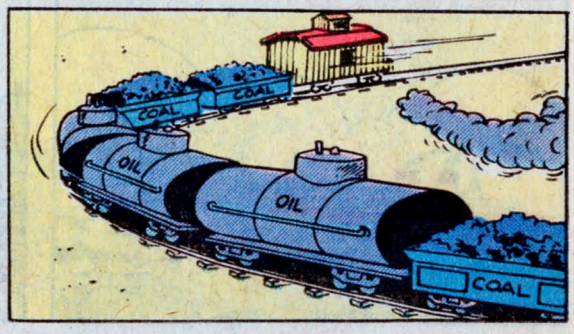
OIL PRODUCED POWER TO HEAT HOMES AND OPERATE TELEVISION SETS.



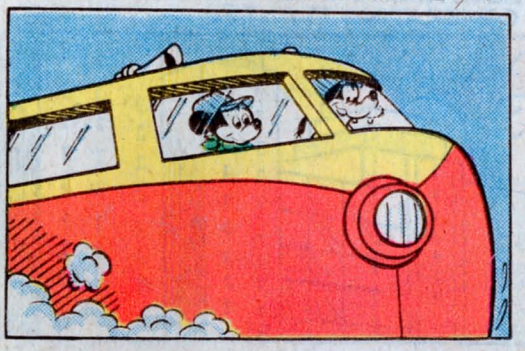
WHICH MEANT MORE POWER PLANTS WERE BUILT TO PRODUCE MORE ELECTRICITY.



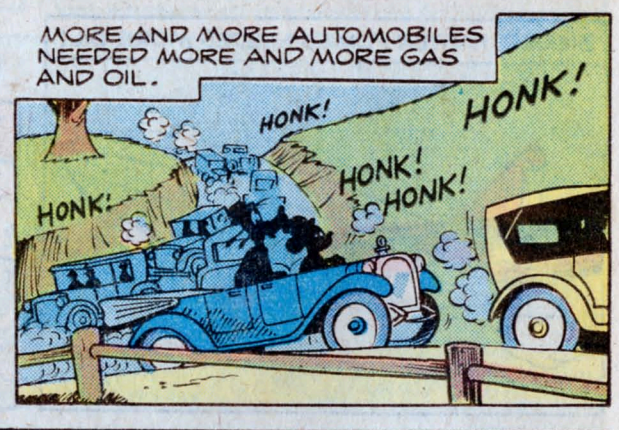
THIS MEANT MORE OIL AND GAS AND COAL WERE NEEDED TO RUN THE POWER PLANTS...



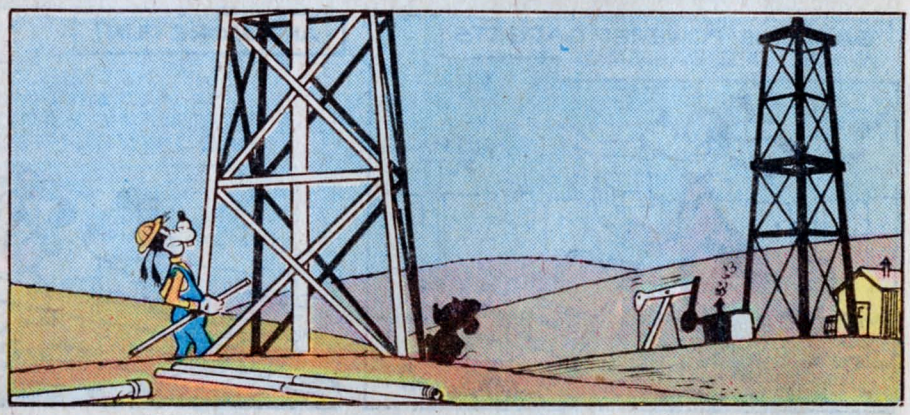
NOT TO MENTION THE LOCOMOTIVE THAT DRANK MORE DIESEL FUEL!

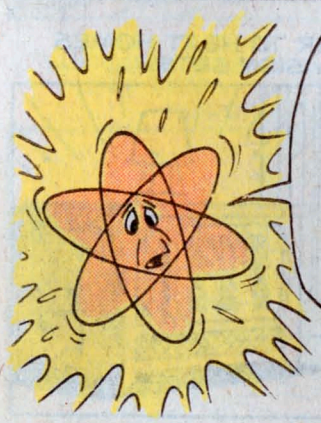


MORE AND MORE AUTOMOBILES NEEDED MORE AND MORE GAS AND OIL.



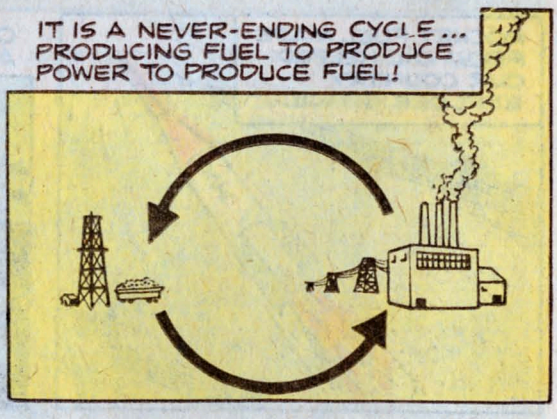
THE ONLY WAY TO MEET THIS DEMAND WAS TO DRILL MORE OIL WELLS. AND, OF COURSE, IT TOOK ENERGY TO RUN THE DRILLING RIG.



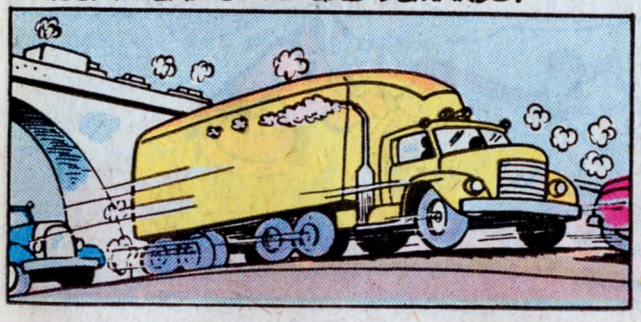


THUS—IT TAKES ENERGY TO FIND THE *NEW* ENERGY. AND WHERE DOES *THAT* ENERGY COME FROM? FROM THE ENERGY WE ALREADY HAD!

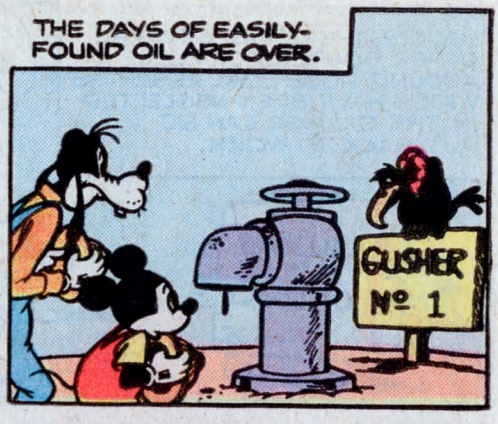
IT IS A NEVER-ENDING CYCLE... PRODUCING FUEL TO PRODUCE POWER TO PRODUCE FUEL!



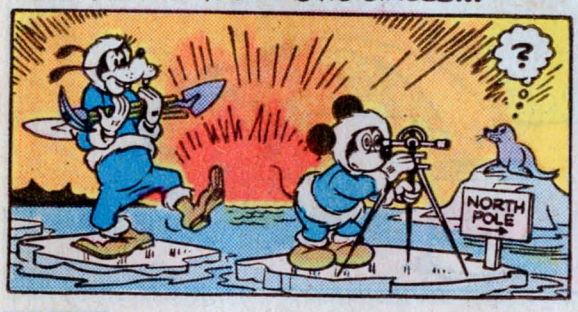
IN FACT, WE'RE USING SO MUCH OIL SO FAST THAT IT'S GETTING HARDER AND HARDER TO FIND NEW SOURCES TO KEEP AHEAD OF FUTURE DEMANDS!



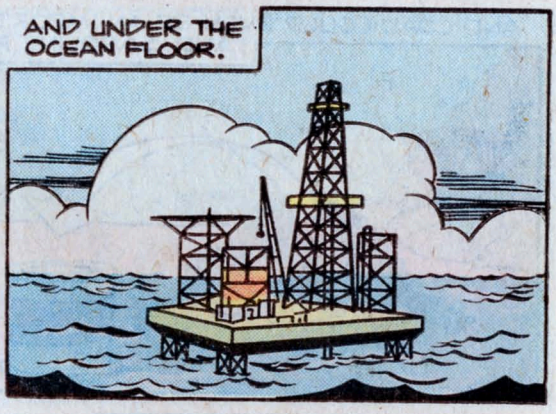
THE DAYS OF EASILY-FOUND OIL ARE OVER.



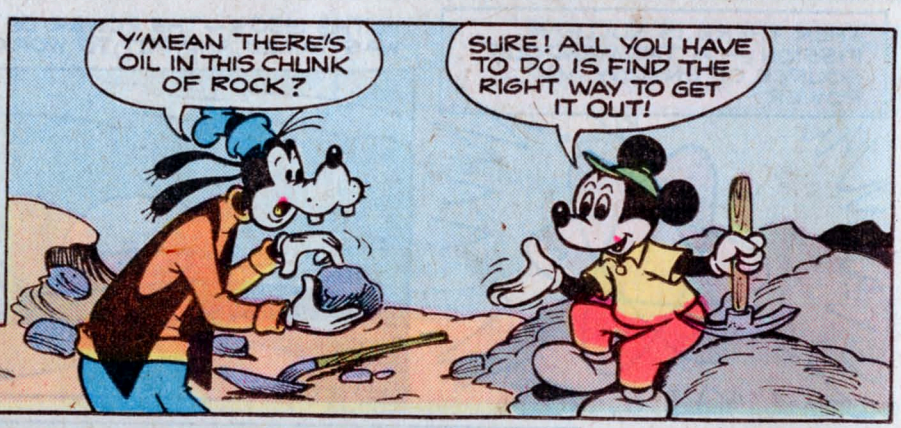
SO THE SEARCH FOR OIL AND NATURAL GAS HAS TO BE PUSHED TO MORE REMOTE AND DIFFICULT PLACES, LIKE FAR ABOVE THE ARCTIC CIRCLE...



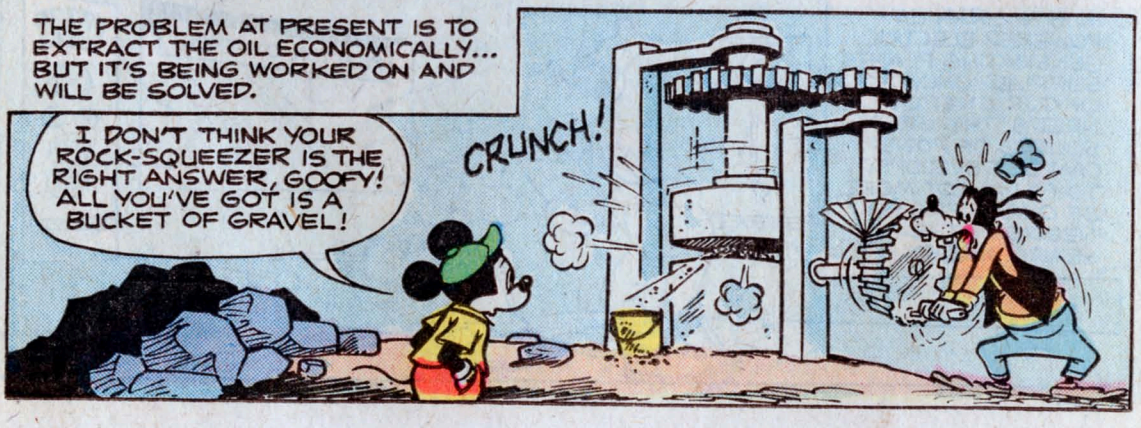
AND UNDER THE OCEAN FLOOR.

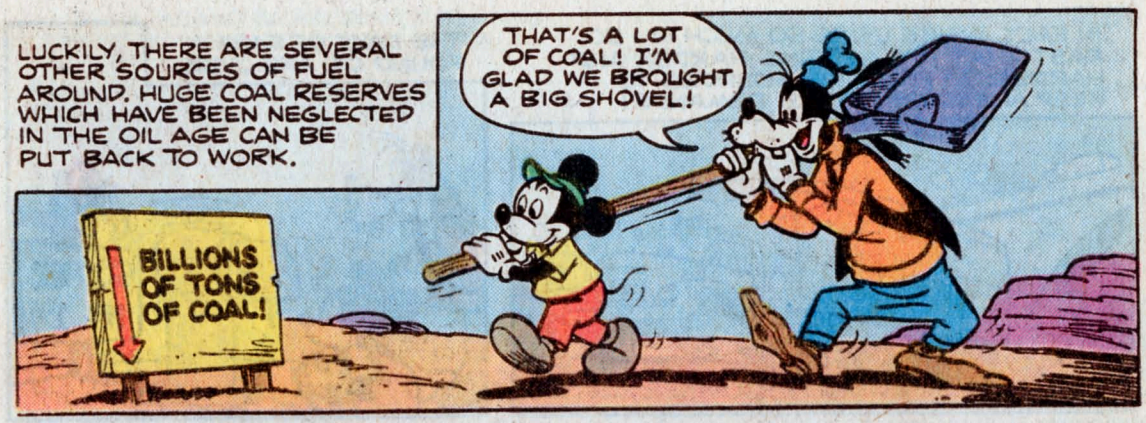


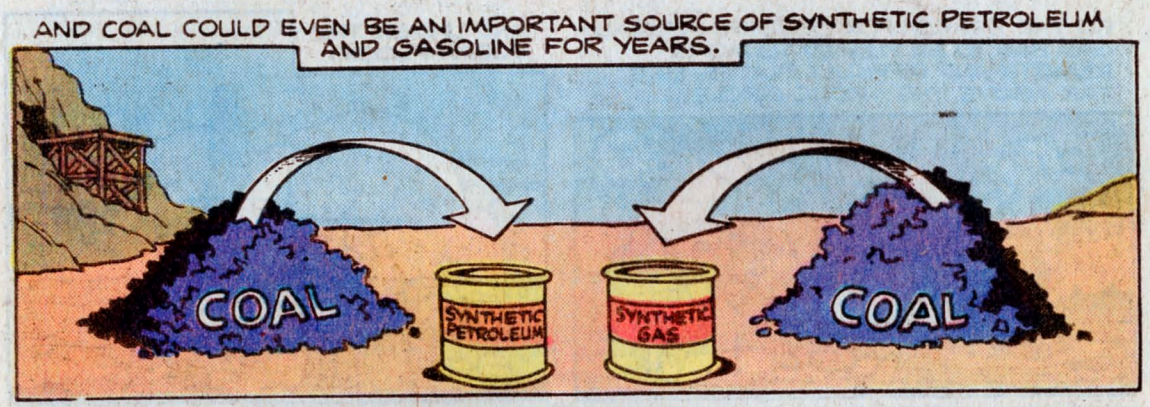
NEW SOURCES OF OIL MUST BE FOUND. FOR EXAMPLE, IT'S ESTIMATED THAT THERE ARE 100 BILLION BARRELS OF OIL LOCKED UP IN OIL SHALE.

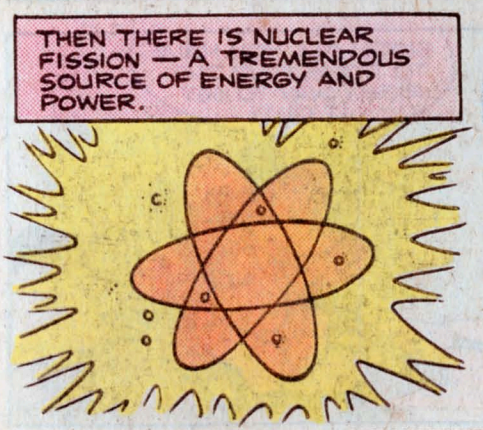


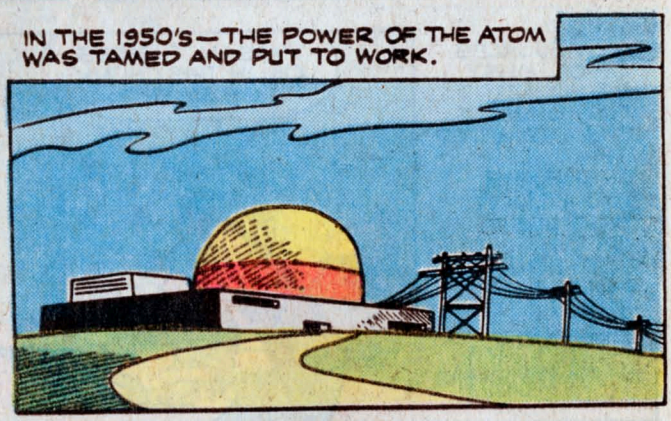
THE PROBLEM AT PRESENT IS TO EXTRACT THE OIL ECONOMICALLY... BUT IT'S BEING WORKED ON AND WILL BE SOLVED.

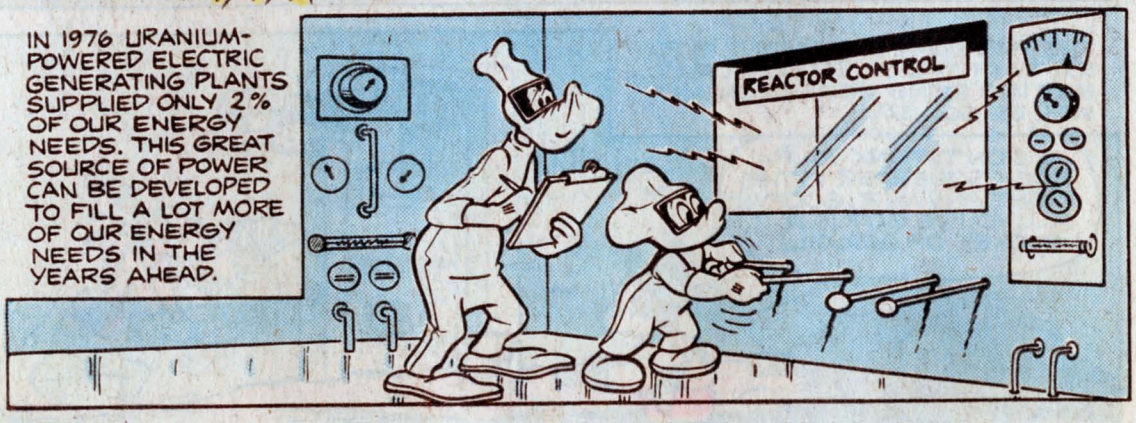



LUCKILY, THERE ARE SEVERAL OTHER SOURCES OF FUEL AROUND. HUGE COAL RESERVES WHICH HAVE BEEN NEGLECTED IN THE OIL AGE CAN BE PUT BACK TO WORK.
THAT'S A LOT OF COAL! I'M GLAD WE BROUGHT A BIG SHOVEL!
BILLIONS OF TONS OF COAL!

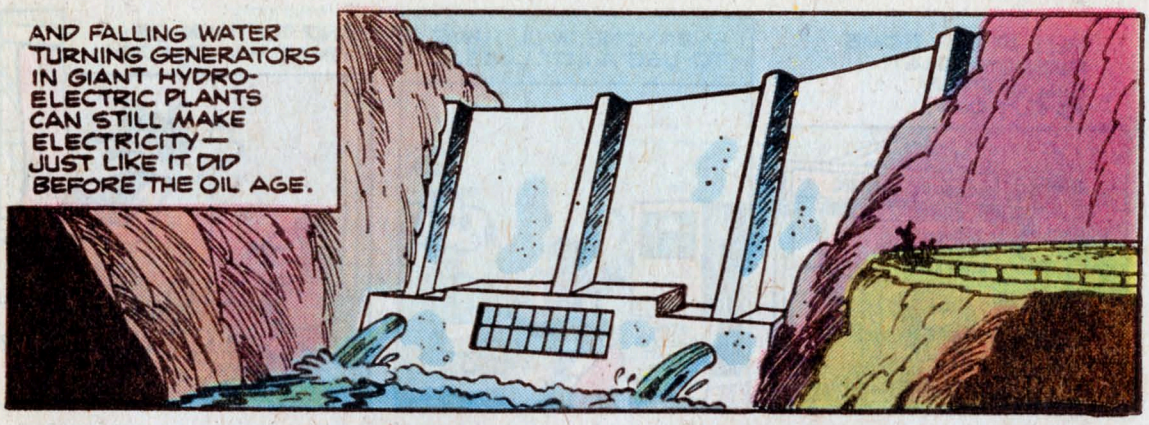

AND COAL COULD EVEN BE AN IMPORTANT SOURCE OF SYNTHETIC PETROLEUM AND GASOLINE FOR YEARS.
COAL
SYNTHETIC PETROLEUM
SYNTHETIC GAS
COAL


THEN THERE IS NUCLEAR FISSION — A TREMENDOUS SOURCE OF ENERGY AND POWER.


IN THE 1950's—THE POWER OF THE ATOM WAS TAMED AND PUT TO WORK.

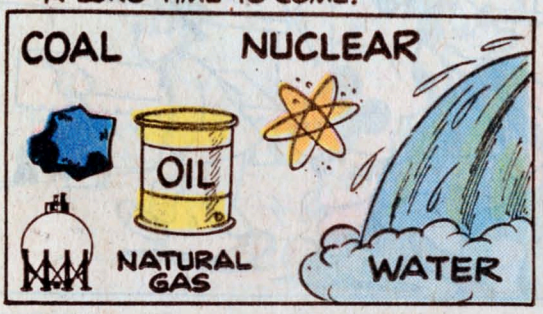

IN 1976 URANIUM-POWERED ELECTRIC GENERATING PLANTS SUPPLIED ONLY 2% OF OUR ENERGY NEEDS. THIS GREAT SOURCE OF POWER CAN BE DEVELOPED TO FILL A LOT MORE OF OUR ENERGY NEEDS IN THE YEARS AHEAD.
REACTOR CONTROL

AND FALLING WATER TURNING GENERATORS IN GIANT HYDRO-ELECTRIC PLANTS CAN STILL MAKE ELECTRICITY— JUST LIKE IT DID BEFORE THE OIL AGE.

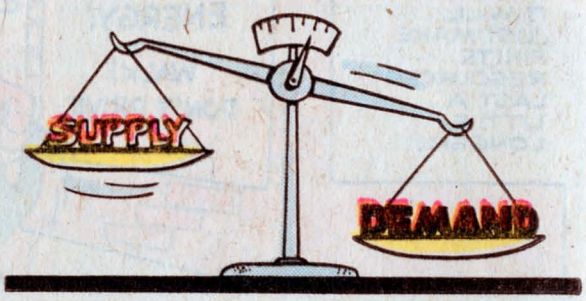


IN FACT, THE ELECTRIC POWER PROJECT AT NIAGARA FALLS IS THE LARGEST IN THE WORLD.

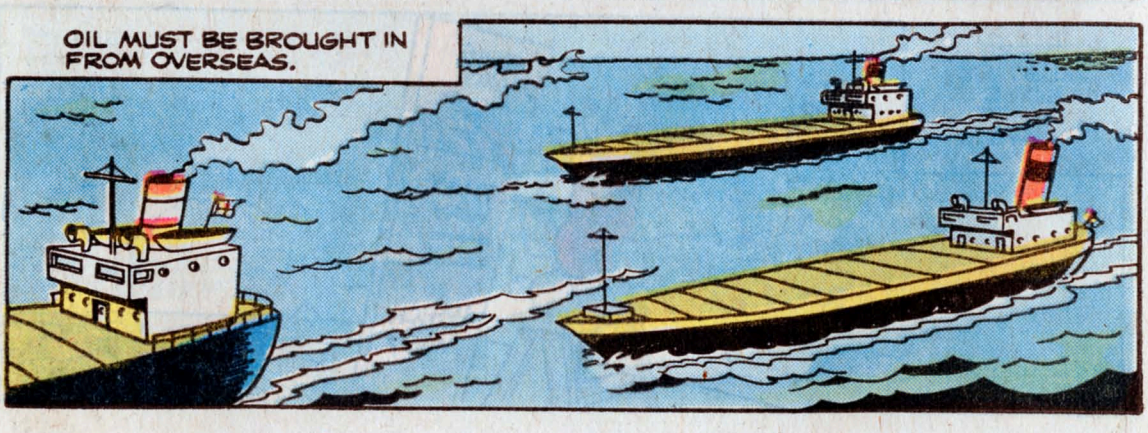
WITH ALL OF THESE SOURCES OF ENERGY IN THIS COUNTRY, YOU'D THINK THERE'D BE ENOUGH FOR A LONG TIME TO COME.

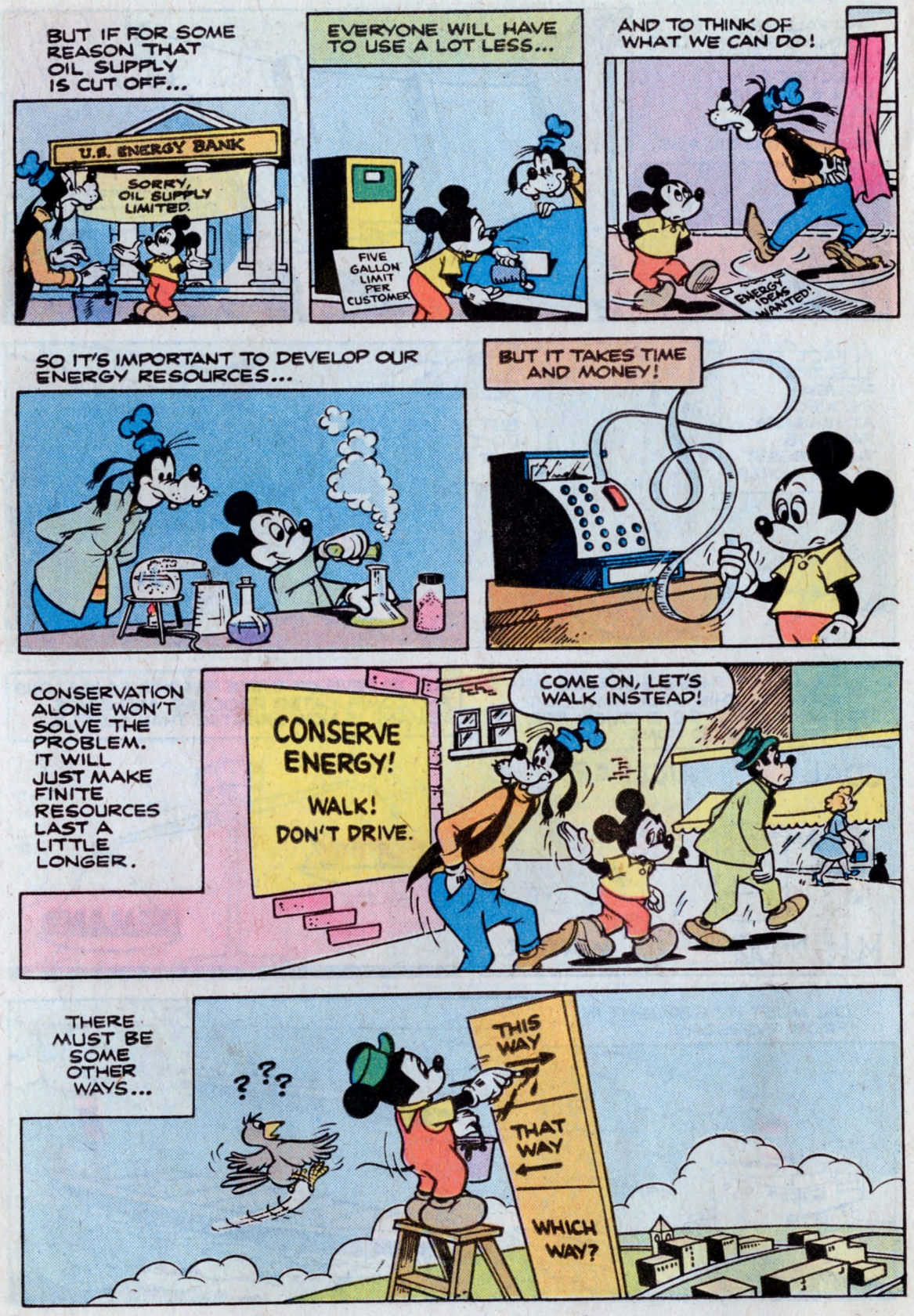


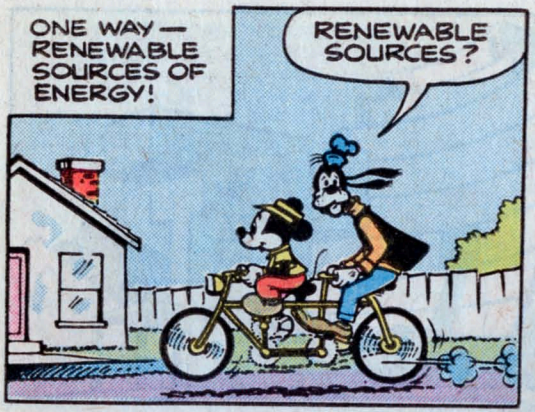
BUT TO DEVELOP THESE RESOURCES IS A LONG AND COMPLICATED PROCESS. AND SINCE DEMAND IS NOW GREATER THAN SUPPLY...

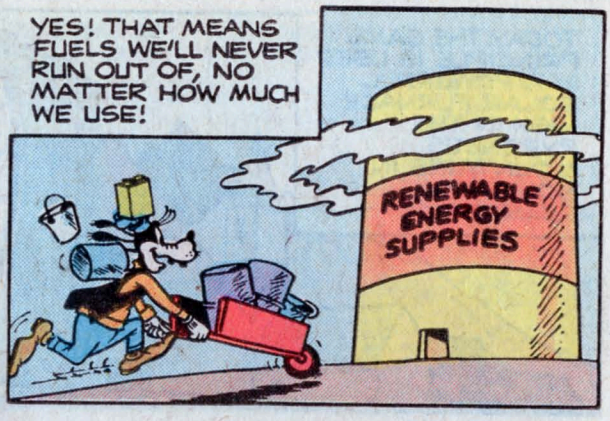


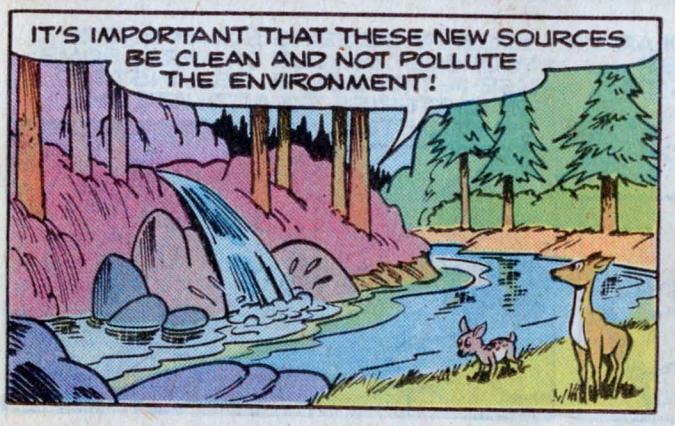
OIL MUST BE BROUGHT IN FROM OVERSEAS.

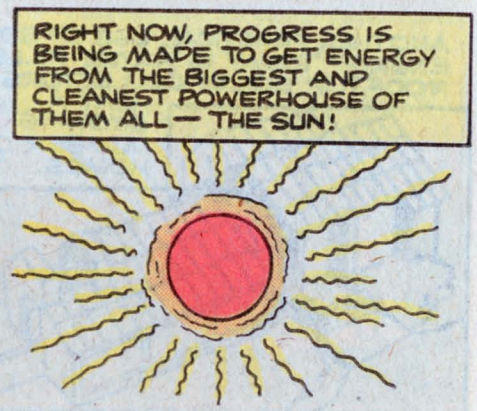



BUT IF FOR SOME REASON THAT OIL SUPPLY IS CUT OFF...
U.S. ENERGY BANK
SORRY, OIL SUPPLY LIMITED.
EVERYONE WILL HAVE TO USE A LOT LESS...
FIVE GALLON LIMIT PER CUSTOMER
AND TO THINK OF WHAT WE CAN DO!
ENERGY IDEAS WANTED!
SO IT'S IMPORTANT TO DEVELOP OUR ENERGY RESOURCES...
BUT IT TAKES TIME AND MONEY!
CONSERVATION ALONE WON'T SOLVE THE PROBLEM. IT WILL JUST MAKE FINITE RESOURCES LAST A LITTLE LONGER.
CONSERVE ENERGY!
WALK! DON'T DRIVE.
COME ON, LET'S WALK INSTEAD!
THERE MUST BE SOME OTHER WAYS...
? ? ?
THIS WAY
THAT WAY
WHICH WAY?

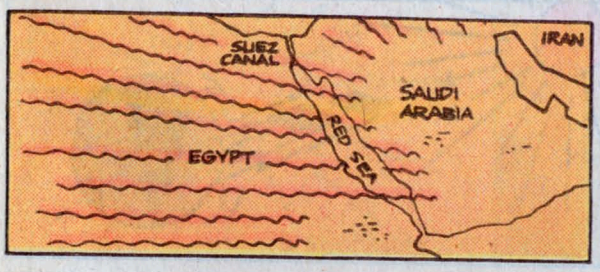




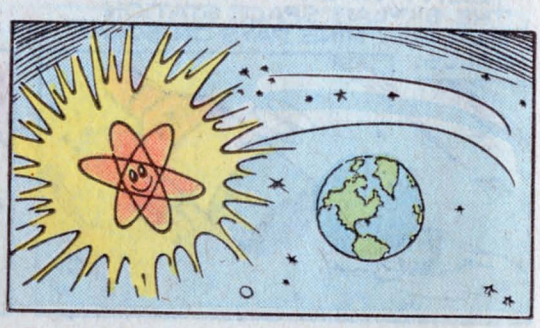


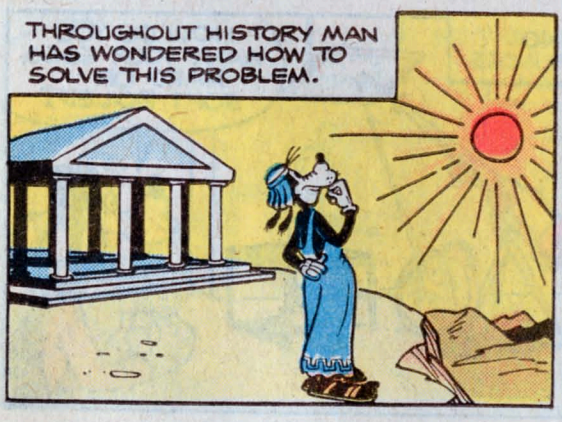


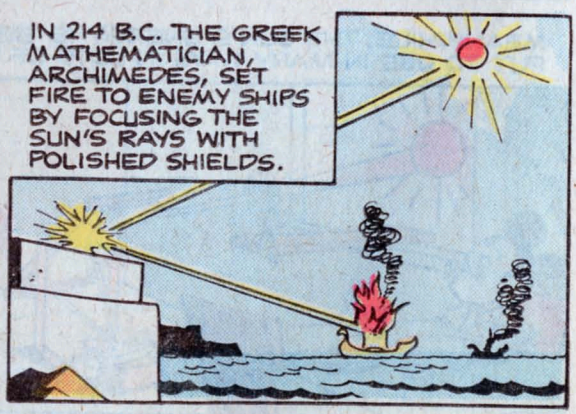
MUCH OF THE WORLD'S OIL IS FOUND IN ONLY A FEW COUNTRIES IN THE MIDDLE EAST, BUT SUNLIGHT SHINES OVER THE ENTIRE WORLD EVERY DAY!



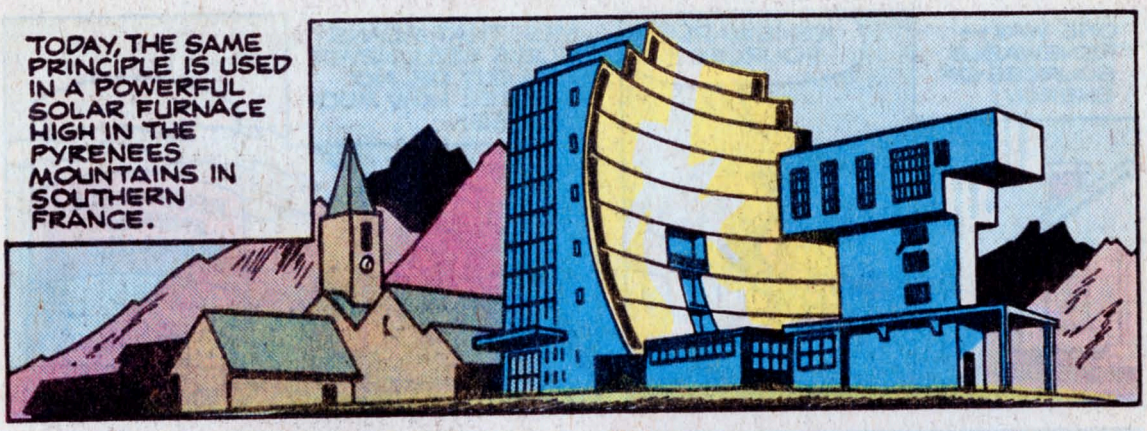
OUR PROBLEM IS HOW TO HARNESS THIS SUNLIGHT AND HOW TO USE IT ECONOMICALLY.



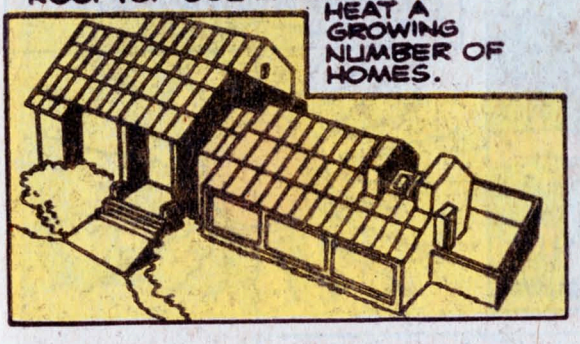




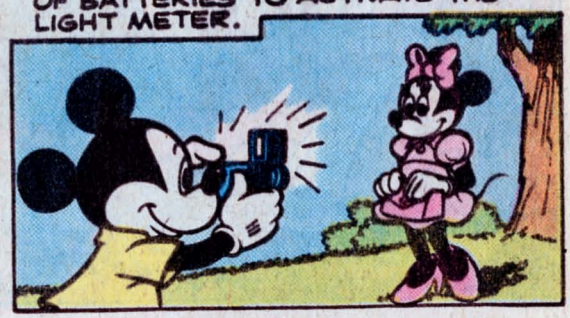
TODAY, THE SAME PRINCIPLE IS USED IN A POWERFUL SOLAR FURNACE HIGH IN THE PYRENEES MOUNTAINS IN SOUTHERN FRANCE.



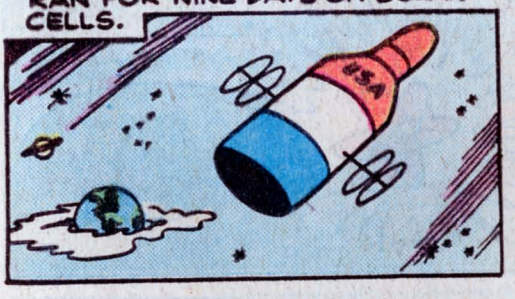
ANOTHER PRACTICAL USE OF SOLAR ENERGY TODAY IS WATER-FILLED ROOFTOP SOLAR COLLECTORS TO HEAT A GROWING NUMBER OF HOMES.



YOU MAY BE USING SOLAR ENERGY YOURSELF IN YOUR CAMERA. SOME USE A TINY SOLAR CELL INSTEAD OF BATTERIES TO ACTIVATE THE LIGHT METER.

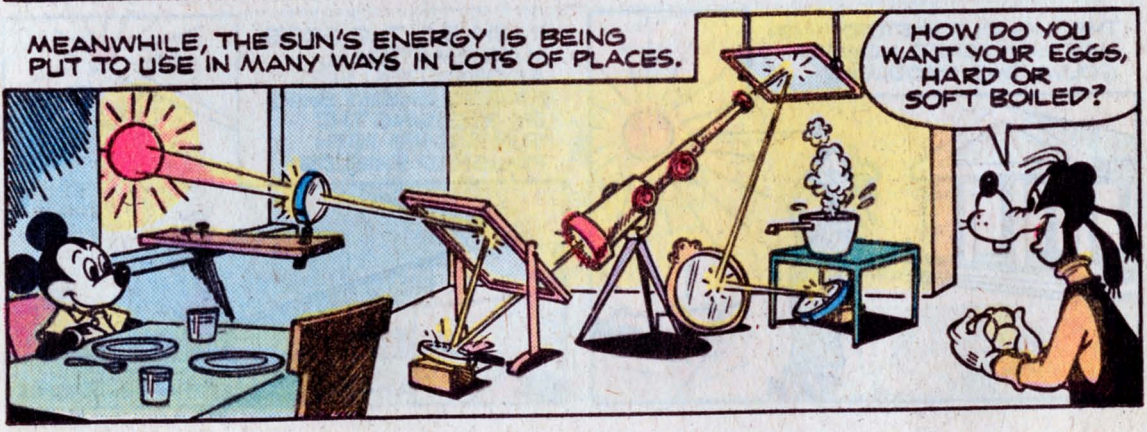


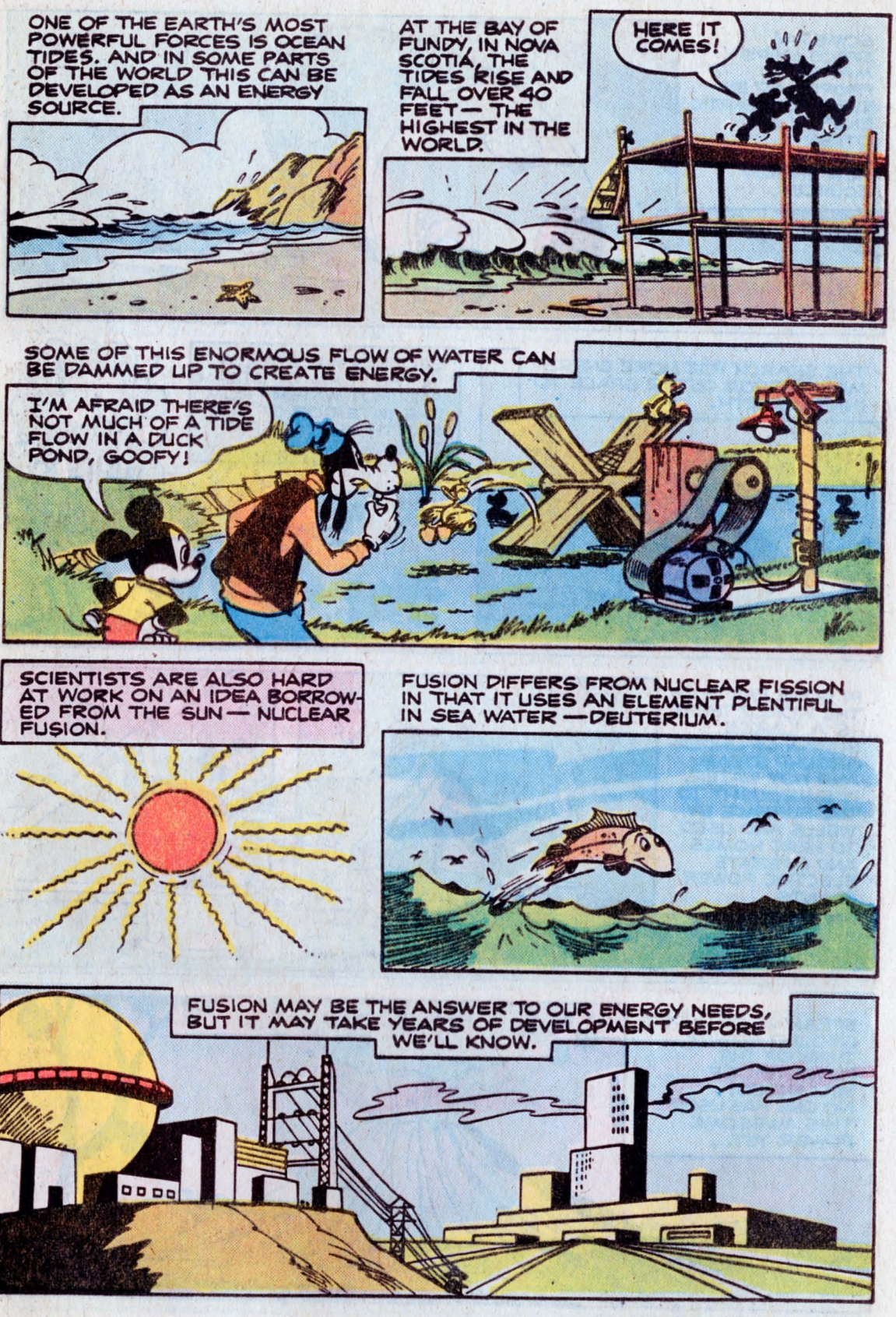
SOLAR CELLS USE AN ELEMENT, SILICON, WHICH CREATES ELECTRICITY WHEN HIT BY LIGHT. THE SKYLAB SPACE STATION RAN FOR NINE DAYS ON SOLAR CELLS.

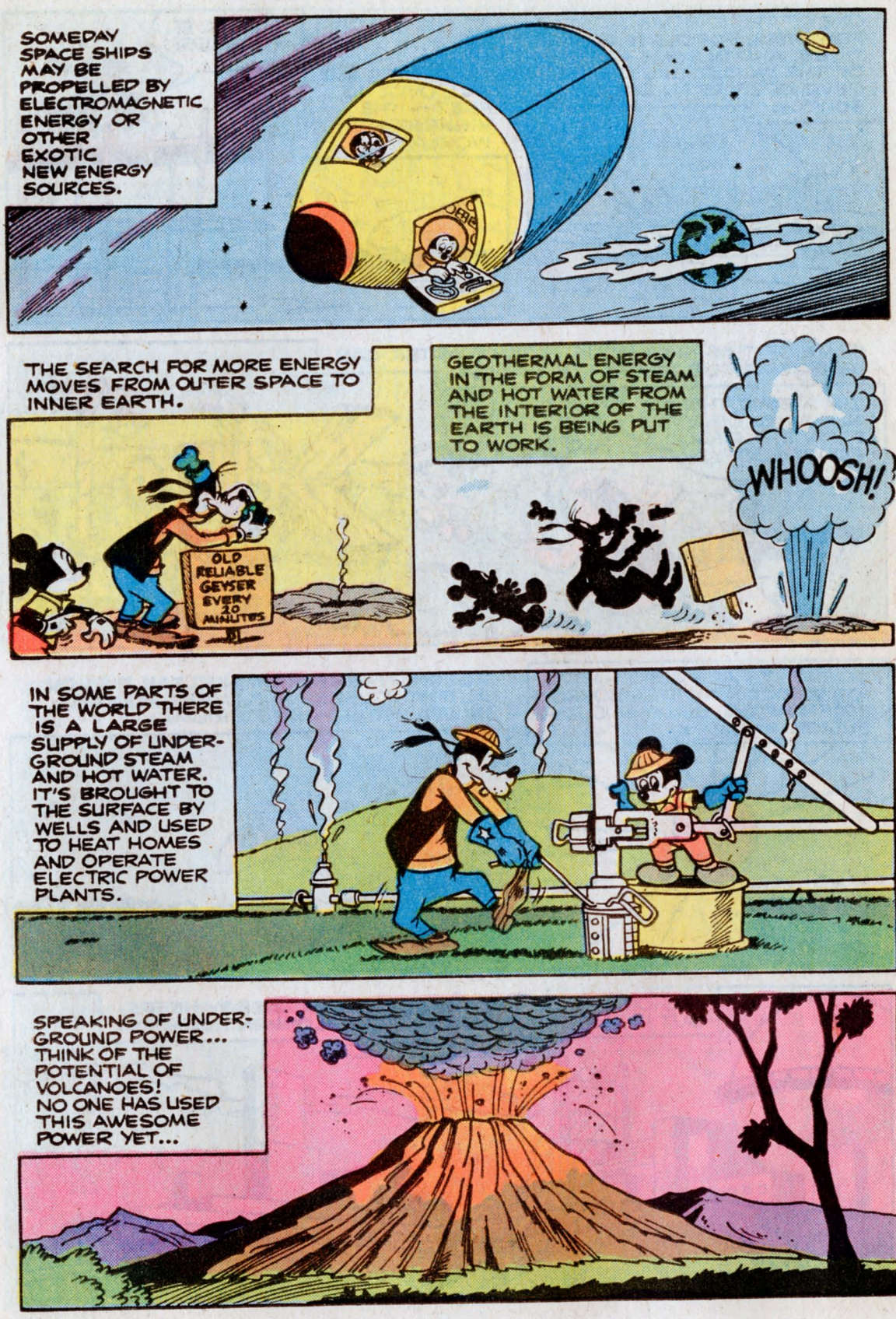


ON THE DRAWING BOARDS OF IMAGINATIVE SCIENTISTS ARE PLANS FOR HUGE SOLAR POWER STATIONS WHICH WILL TURN SUNLIGHT INTO ELECTRICITY FOR TRANSMISSION TO EARTH.

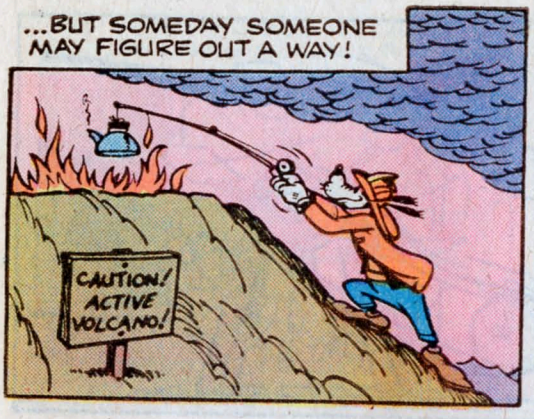
MEANWHILE, THE SUN'S ENERGY IS BEING PUT TO USE IN MANY WAYS IN LOTS OF PLACES.



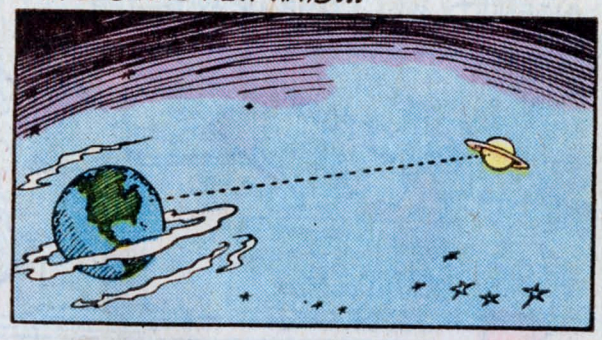

ONE OF THE EARTH'S MOST POWERFUL FORCES IS OCEAN TIDES. AND IN SOME PARTS OF THE WORLD THIS CAN BE DEVELOPED AS AN ENERGY SOURCE.
AT THE BAY OF FUNDY, IN NOVA SCOTIA, THE TIDES RISE AND FALL OVER 40 FEET — THE HIGHEST IN THE WORLD.
HERE IT COMES!
SOME OF THIS ENORMOUS FLOW OF WATER CAN BE DAMMED UP TO CREATE ENERGY.
I'M AFRAID THERE'S NOT MUCH OF A TIDE FLOW IN A DUCK POND, GOOFY!
SCIENTISTS ARE ALSO HARD AT WORK ON AN IDEA BORROWED FROM THE SUN — NUCLEAR FUSION.
FUSION DIFFERS FROM NUCLEAR FISSION IN THAT IT USES AN ELEMENT PLENTIFUL IN SEA WATER — DEUTERIUM.
FUSION MAY BE THE ANSWER TO OUR ENERGY NEEDS, BUT IT MAY TAKE YEARS OF DEVELOPMENT BEFORE WE'LL KNOW.


SOMEDAY SPACE SHIPS MAY BE PROPELLED BY ELECTROMAGNETIC ENERGY OR OTHER EXOTIC NEW ENERGY SOURCES.
THE SEARCH FOR MORE ENERGY MOVES FROM OUTER SPACE TO INNER EARTH.
OLD RELIABLE GEYSER EVERY 20 MINUTES
GEOTHERMAL ENERGY IN THE FORM OF STEAM AND HOT WATER FROM THE INTERIOR OF THE EARTH IS BEING PUT TO WORK.
WHOOSH!
IN SOME PARTS OF THE WORLD THERE IS A LARGE SUPPLY OF UNDER-GROUND STEAM AND HOT WATER. IT'S BROUGHT TO THE SURFACE BY WELLS AND USED TO HEAT HOMES AND OPERATE ELECTRIC POWER PLANTS.
SPEAKING OF UNDER-GROUND POWER... THINK OF THE POTENTIAL OF VOLCANOES! NO ONE HAS USED THIS AWESOME POWER YET...

...BUT SOMEDAY SOMEONE MAY FIGURE OUT A WAY!



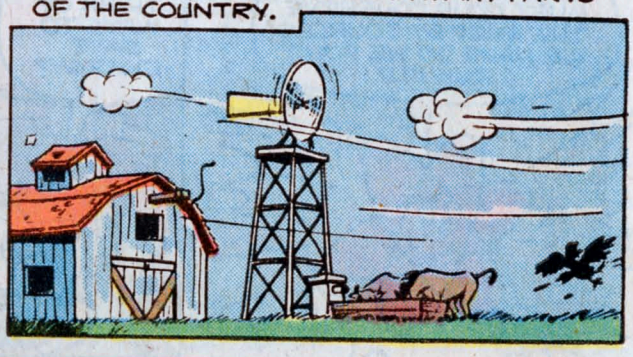
A FANTASTIC NEW INVENTION CALLED A *LASER* HAS ENABLED US TO USE ENERGY IN EXCITING NEW WAYS...



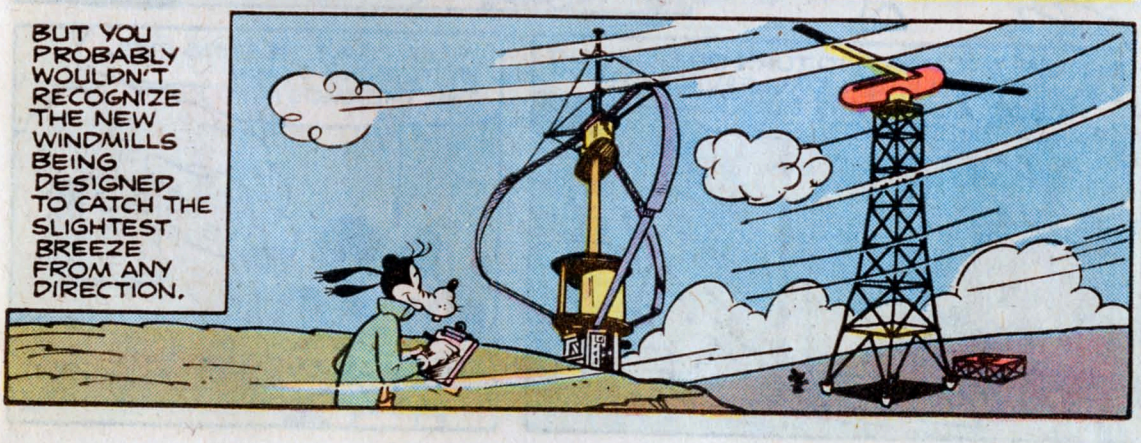
JOBS AS DELICATE AS EYE OPERATIONS AND AS COMMON AS WELDING.

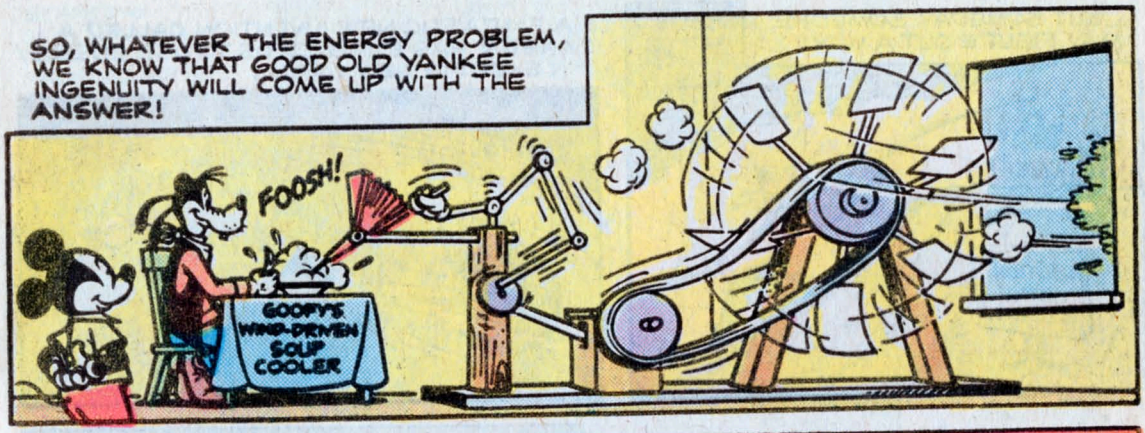
ALONG WITH RESEARCH IN THE NEWER AREAS OF ENERGY IS A STRONG INTEREST IN ONE OF OUR OLDEST POWER SOURCES — WIND.

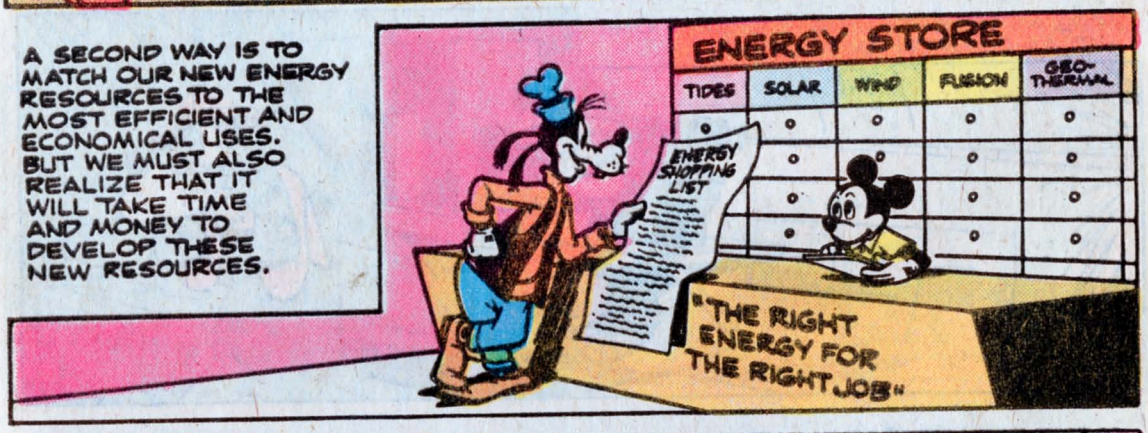
THOUSANDS OF DEPENDABLE OLD WINDMILLS STILL PUMP WATER IN MANY PARTS OF THE COUNTRY.

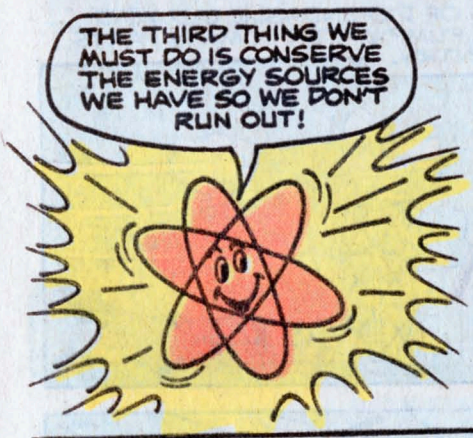


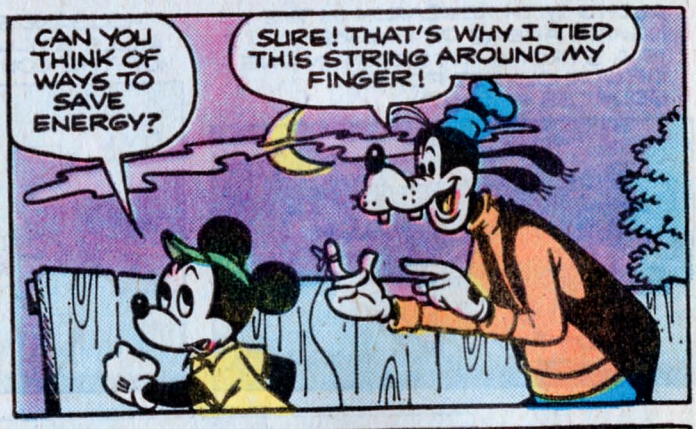
BUT YOU PROBABLY WOULDN'T RECOGNIZE THE NEW WINDMILLS BEING DESIGNED TO CATCH THE SLIGHTEST BREEZE FROM ANY DIRECTION.

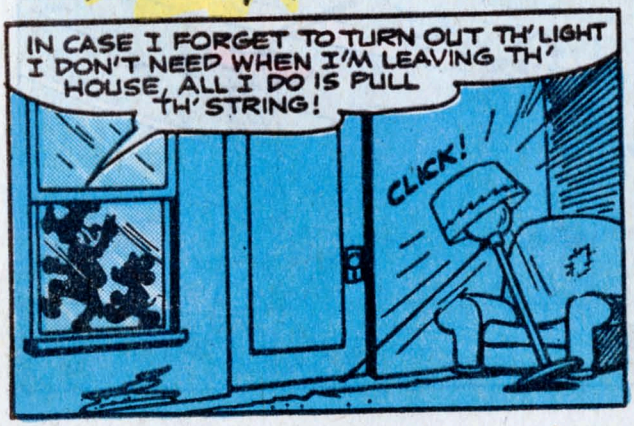


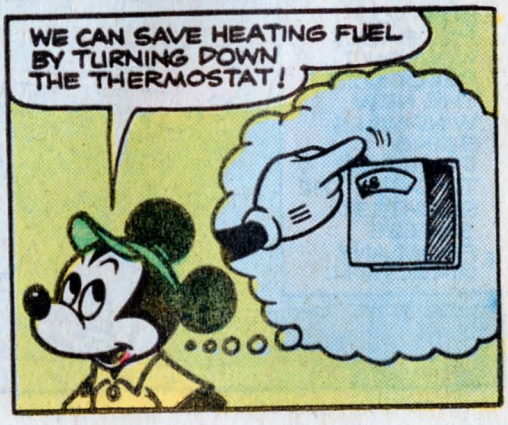

SO, WHATEVER THE ENERGY PROBLEM, WE KNOW THAT GOOD OLD YANKEE INGENUITY WILL COME UP WITH THE ANSWER!
FOOSH!
GOOFY'S WIND-DRIVEN SOUP COOLER

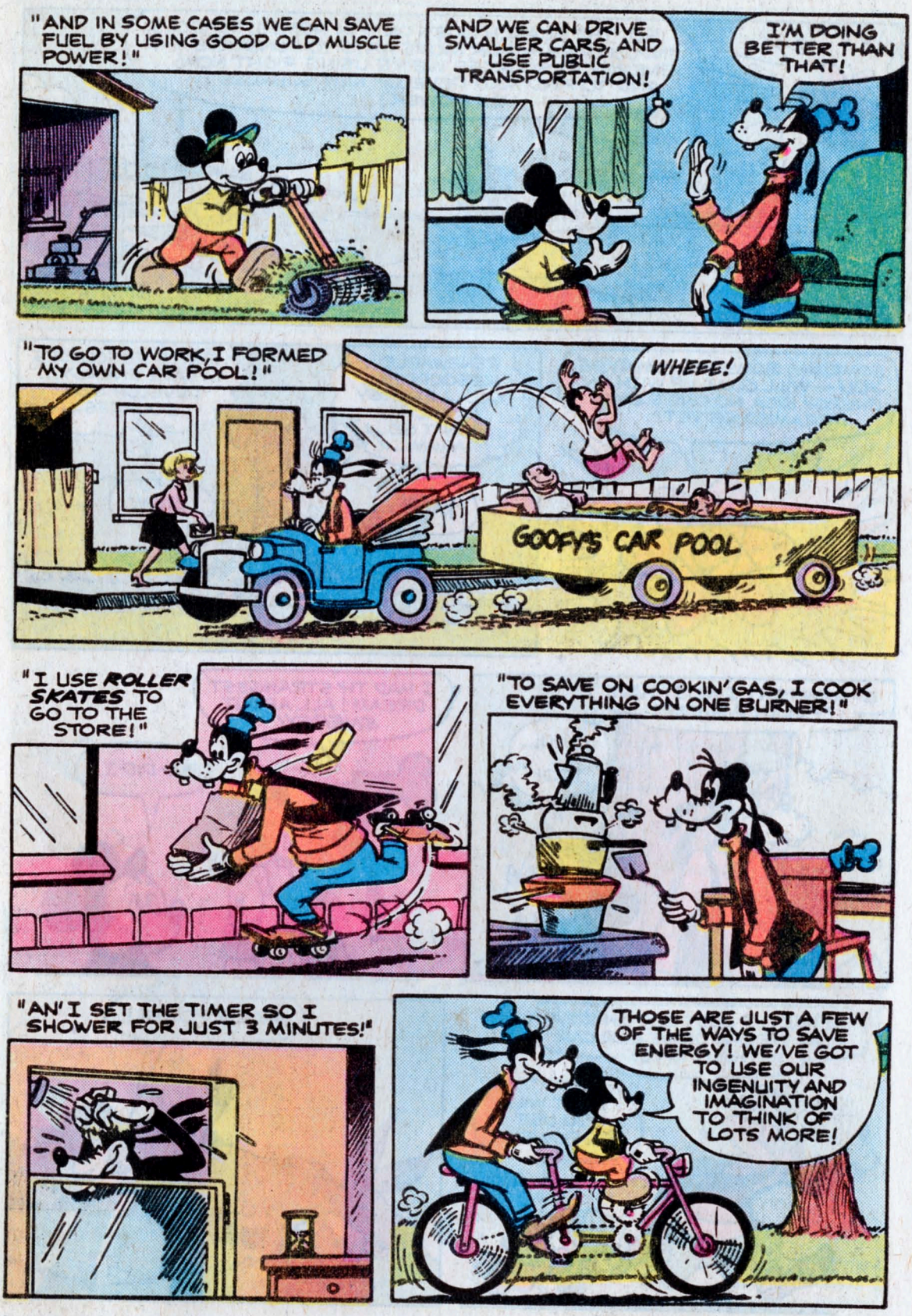

A SECOND WAY IS TO MATCH OUR NEW ENERGY RESOURCES TO THE MOST EFFICIENT AND ECONOMICAL USES. BUT WE MUST ALSO REALIZE THAT IT WILL TAKE TIME AND MONEY TO DEVELOP THESE NEW RESOURCES.
ENERGY STORE
TIDES
SOLAR
WIND
FUSION
GEO-THERMAL
ENERGY SHOPPING LIST
"THE RIGHT ENERGY FOR THE RIGHT JOB"

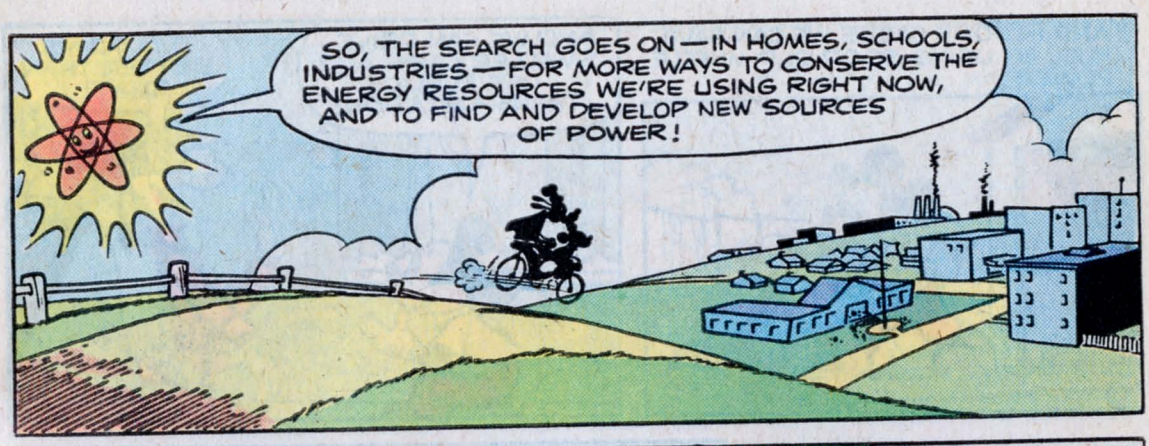

THE THIRD THING WE MUST DO IS CONSERVE THE ENERGY SOURCES WE HAVE SO WE DON'T RUN OUT!

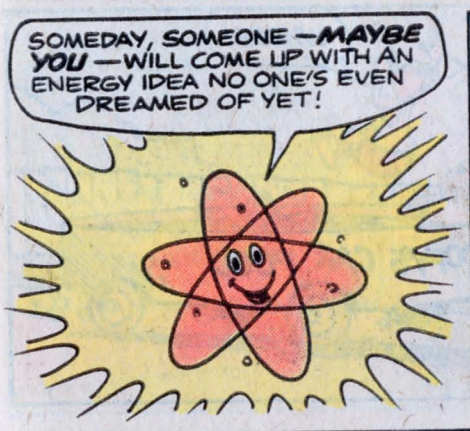

CAN YOU THINK OF WAYS TO SAVE ENERGY?
SURE! THAT'S WHY I TIED THIS STRING AROUND MY FINGER!

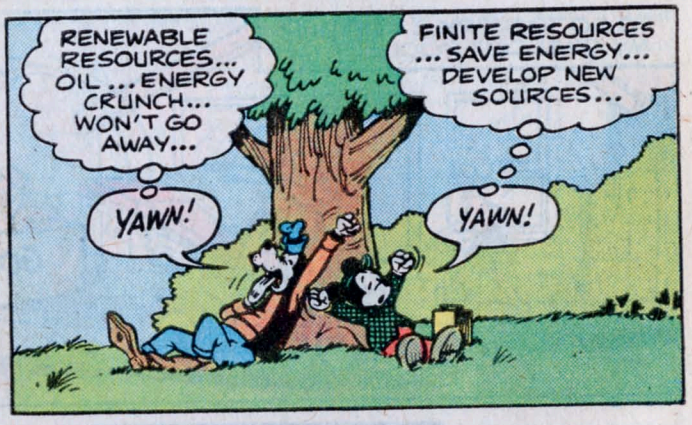

IN CASE I FORGET TO TURN OUT TH' LIGHT I DON'T NEED WHEN I'M LEAVING TH' HOUSE, ALL I DO IS PULL TH' STRING!
CLICK!


WE CAN SAVE HEATING FUEL BY TURNING DOWN THE THERMOSTAT!


"AND IN SOME CASES WE CAN SAVE FUEL BY USING GOOD OLD MUSCLE POWER!"
AND WE CAN DRIVE SMALLER CARS, AND USE PUBLIC TRANSPORTATION!
I'M DOING BETTER THAN THAT!
"TO GO TO WORK, I FORMED MY OWN CAR POOL!"
WHEEE!
GOOFY'S CAR POOL
"I USE ROLLER SKATES TO GO TO THE STORE!"
"TO SAVE ON COOKIN' GAS, I COOK EVERYTHING ON ONE BURNER!"
"AN' I SET THE TIMER SO I SHOWER FOR JUST 3 MINUTES!"
THOSE ARE JUST A FEW OF THE WAYS TO SAVE ENERGY! WE'VE GOT TO USE OUR INGENUITY AND IMAGINATION TO THINK OF LOTS MORE!

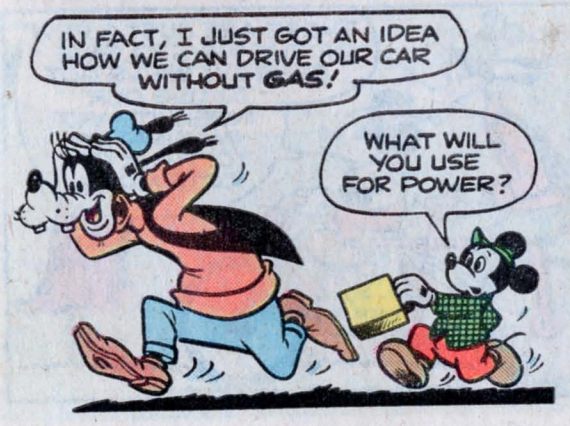

SO, THE SEARCH GOES ON—IN HOMES, SCHOOLS, INDUSTRIES—FOR MORE WAYS TO CONSERVE THE ENERGY RESOURCES WE'RE USING RIGHT NOW, AND TO FIND AND DEVELOP NEW SOURCES OF POWER!

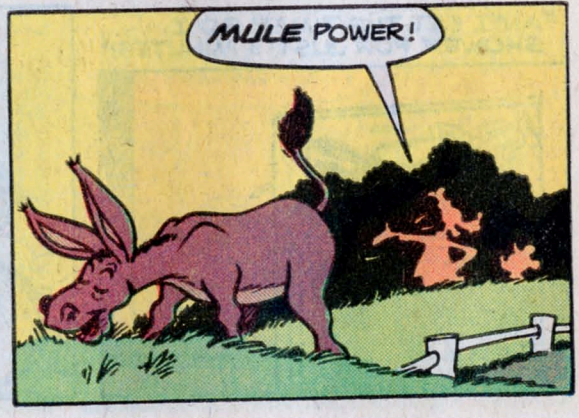

SOMEDAY, SOMEONE—MAYBE YOU—WILL COME UP WITH AN ENERGY IDEA NO ONE'S EVEN DREAMED OF YET!

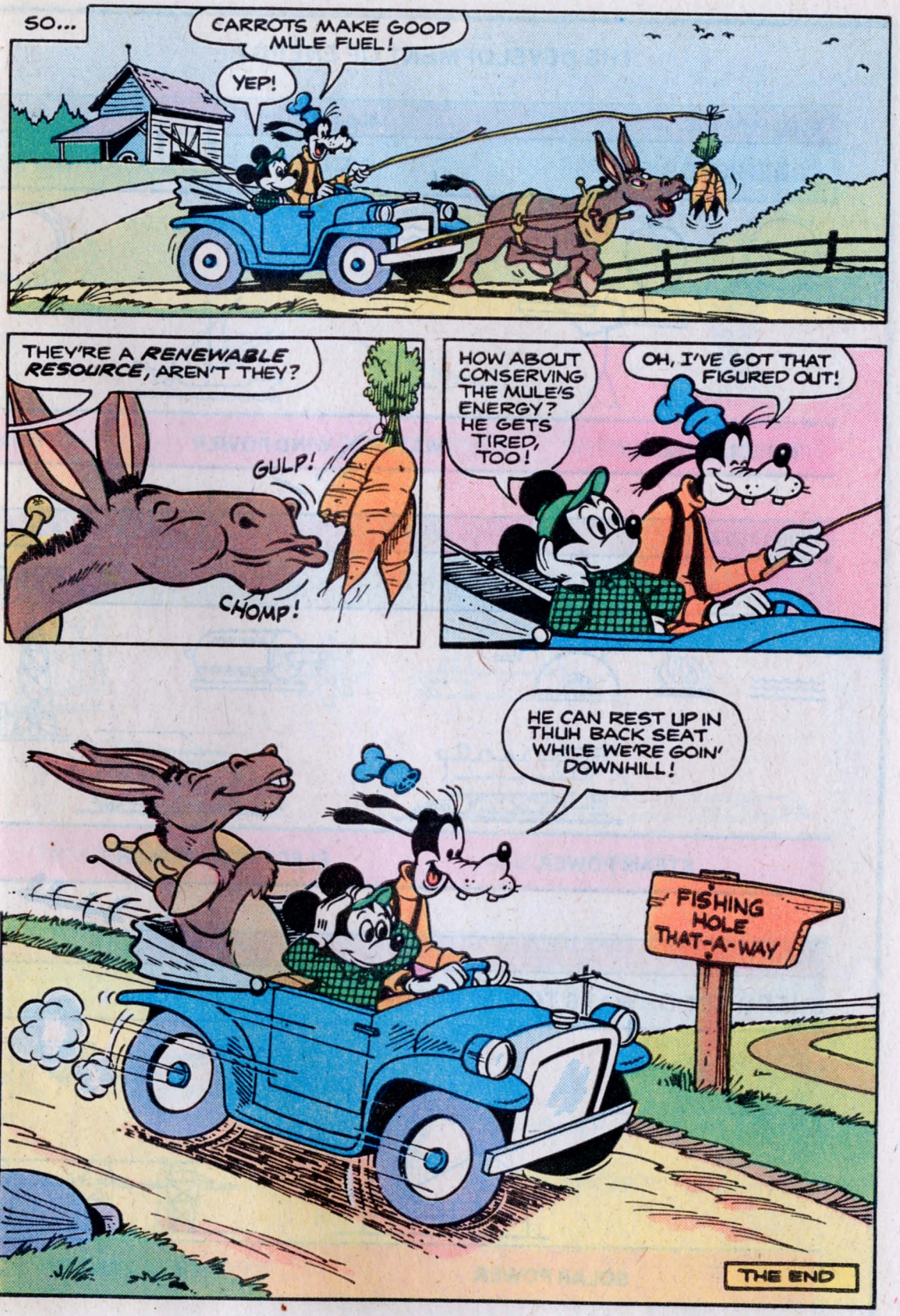

RENEWABLE RESOURCES... OIL... ENERGY CRUNCH... WON'T GO AWAY...
YAWN!
FINITE RESOURCES ... SAVE ENERGY... DEVELOP NEW SOURCES...
YAWN!

G-GAWRSH! I MUST HAVE FALLEN ASLEEP!
YEAH... ME TOO!

I HAD TH' STRANGEST DREAM! ALL ABOUT ENERGY!
SO DID I!


IN FACT, I JUST GOT AN IDEA HOW WE CAN DRIVE OUR CAR WITHOUT GAS!
WHAT WILL YOU USE FOR POWER?

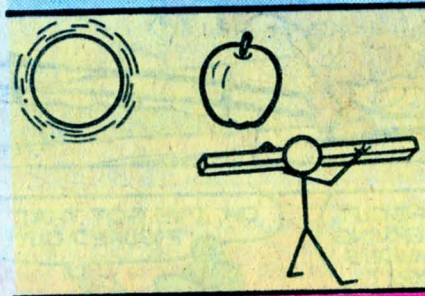

MULE POWER!


SO...
CARROTS MAKE GOOD MULE FUEL!
YEP!
THEY'RE A RENEWABLE RESOURCE, AREN'T THEY?
GULP!
CHOMP!
HOW ABOUT CONSERVING THE MULE'S ENERGY? HE GETS TIRED, TOO!
OH, I'VE GOT THAT FIGURED OUT!
HE CAN REST UP IN THUH BACK SEAT WHILE WE'RE GOIN' DOWNHILL!
FISHING HOLE THAT-A-WAY
THE END

THE DEVELOPMENT OF ENERGY

6000-4000 B.C.

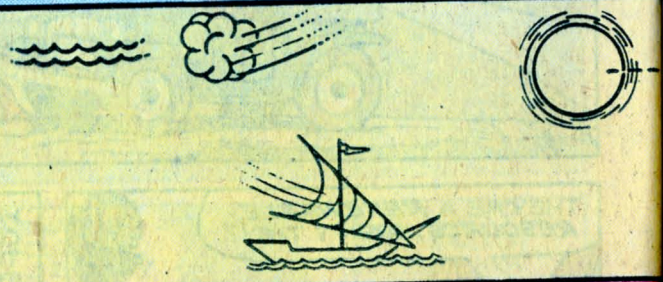
PREHISTORIC



MUSCLE ENERGY

4000 B.C.

ANCIENT EGYPT

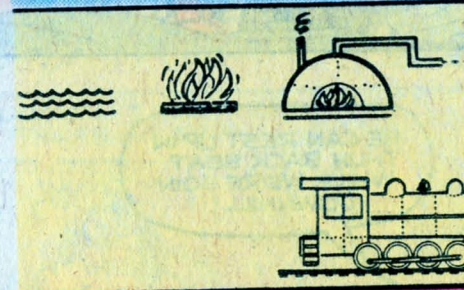


WATER / WIND POWER

EARLY

1700-1850 A.D.

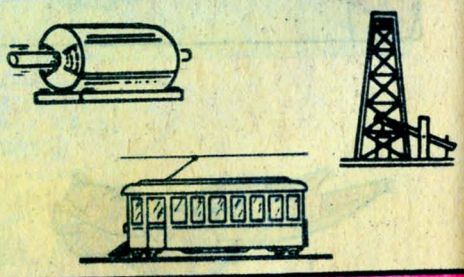
AGE OF ENLIGHTENMENT



STEAM POWER

1850-1950 A.D.

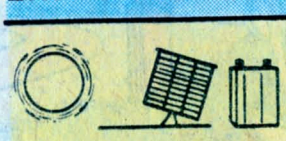
AGE OF



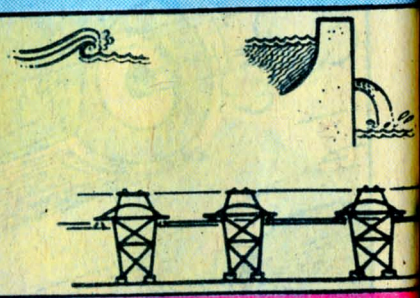
ELECTRICAL POWER

1950 - ?

ENERGY DOORWAYS TO THE FUTURE



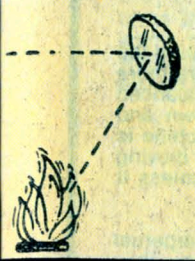
SOLAR POWER



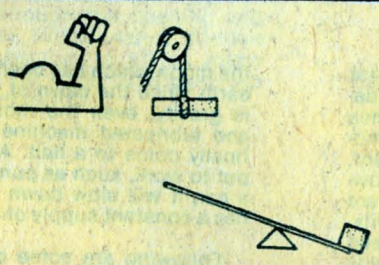
TIDAL POWER

100 B.C.

ANCIENT GREECE



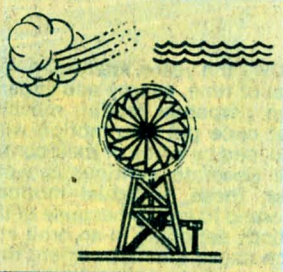
SOLAR POWER



IMPROVED MUSCLE POWER

1200-1500 A.D.

CRUSADES

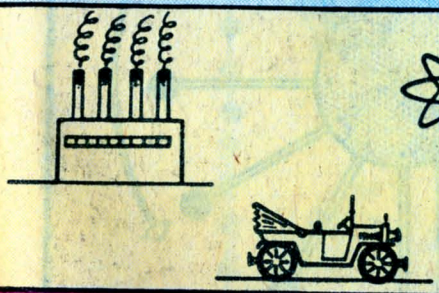


WIND / WATER POWER

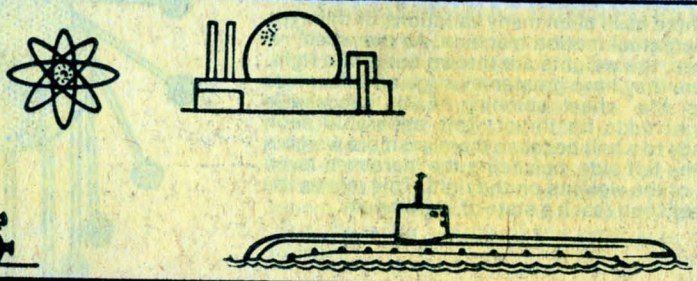
1950 - ?

TECHNOLOGY

ENERGY DOORWAYS TO THE FUTURE

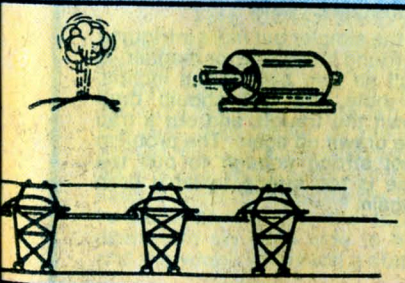


PETROLEUM POWER



NUCLEAR POWER

THE FUTURE



GEOTHERMAL POWER

WHAT WILL YOUR GENERATION DO TO ADD TO THE ENERGY TIME—LINE?

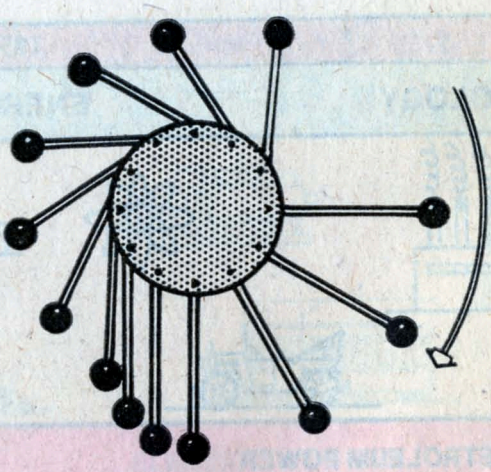
PERPETUAL MOTION MACHINES

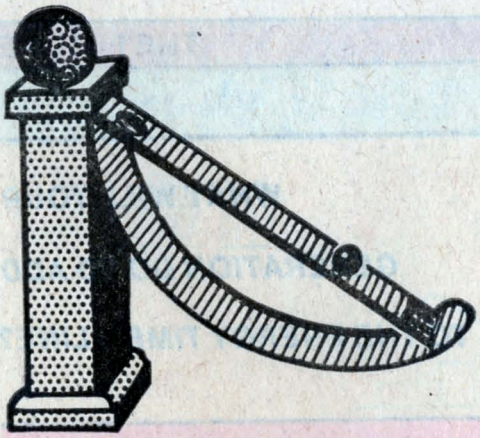
Over the years, many men have spent a great deal of time, energy and expense trying to design perpetual motion machines — machines that once put into motion will remain in motion, and by virtue of their continual movement, will generate continuous work power. However, these perpetual motion machines are doomed to failure because of the law of gravity. A body set going in an orbit at the right speed high above the earth where there is no gravity and no air to cause friction, will keep going indefinitely as a satellite. An example of this is the moon which has been journeying round the earth since the dawn of time. But where there is gravity, even the most perfectly balanced and lubricated machine will slow down and finally come to a halt. And if that machine is put to work, such as pumping water or moving a car, it will slow down very quickly unless it has a constant supply of energy.

Following are some drawings of perpetual motion machines and the reasons why they have not worked.

PIVOTING BALLS

There have been many variations of this type of perpetual motion machine. As the wheel revolves, the weights are thrown out to the right, where they have greater leverage and therefore keep the wheel spinning. Each successive weight adds its thrust. This apparatus soon grinds to a halt because there are more weights on the left side, balancing the increased leverage of the weights on the right. This makes the wheel soon reach a state of equilibrium.



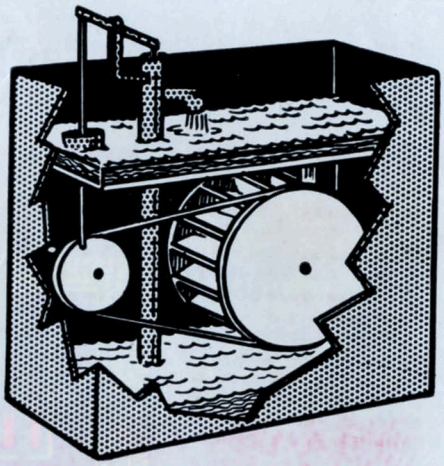


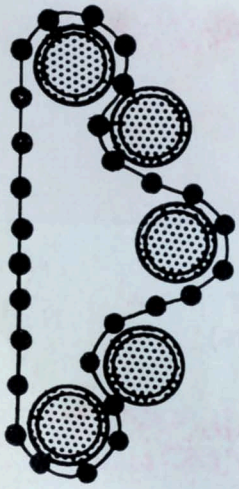
A CYCLE POWERED BY MAGNETISM

This is one of the simpler but more intriguing devices. A large round lodestone, or magnet, is supposed to pull an iron ball up the incline. Arriving at the hole, the ball should drop through, run down the trough, and out a trap door, ready to be drawn up again. The problem is that a magnet strong enough to pull the ball up the plane is too strong to let it drop through a hole again.

THE PUMPING WATER WHEEL

A water wheel is operated by water dropping through a hole in the top reservoir. The wheel drives a pump to lift water from the bottom reservoir. The water is lifted up to the top reservoir, finds its way through the opening and turns the water wheel. Unfortunately, friction won't permit the apparatus to lift as much water as falls, so all the water eventually will end up in the bottom reservoir.



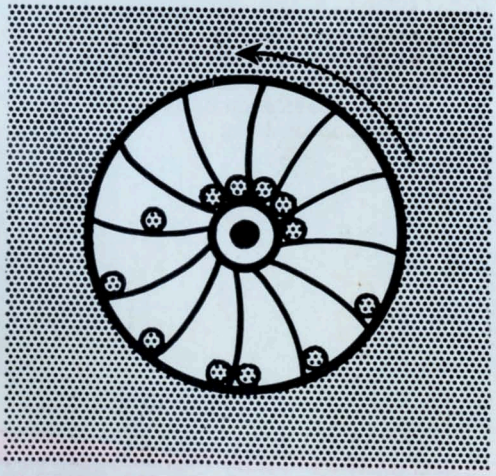


THE CHAIN THAT RUNS FOREVER

This is an endless chain mounted on pulleys. Free-rolling idler wheels on one side make that side of the chain longer than the other side. Since the chain is off-balance, the added weight on the right should pull the chain around and around. It does not work because part of the weight of the right side of the chain is supported by the idler wheels at the points where the chain curves round them. This offsets the extra weight of the right side of the chain.

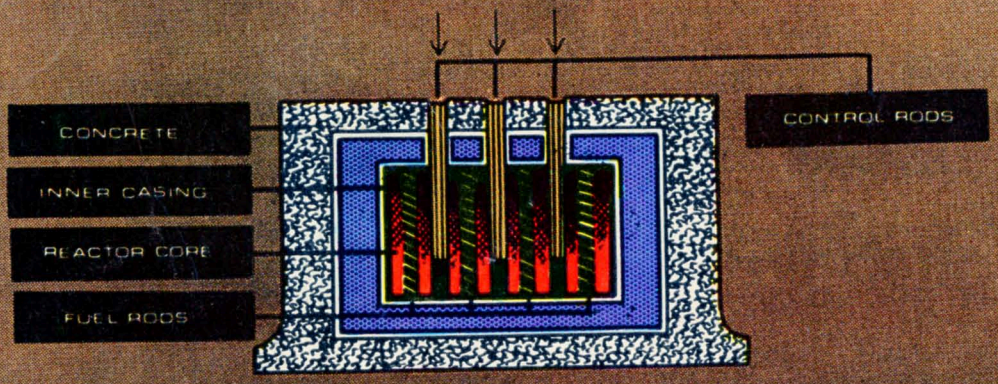
THE CAGE AND BALLS

Here is a leverage problem. The cage is divided into pockets, each of which contains a heavy ball (cross section of cage is shown). Because the balls at the left are farther from the hub than those at the right, the wheel should turn in a counterclockwise direction. As it turns, more balls roll toward the rim to keep it spinning. Despite the illusion of greater leverage at the left, the total force exerted downward on each side is exactly the same and the wheel will reach a state of equilibrium.

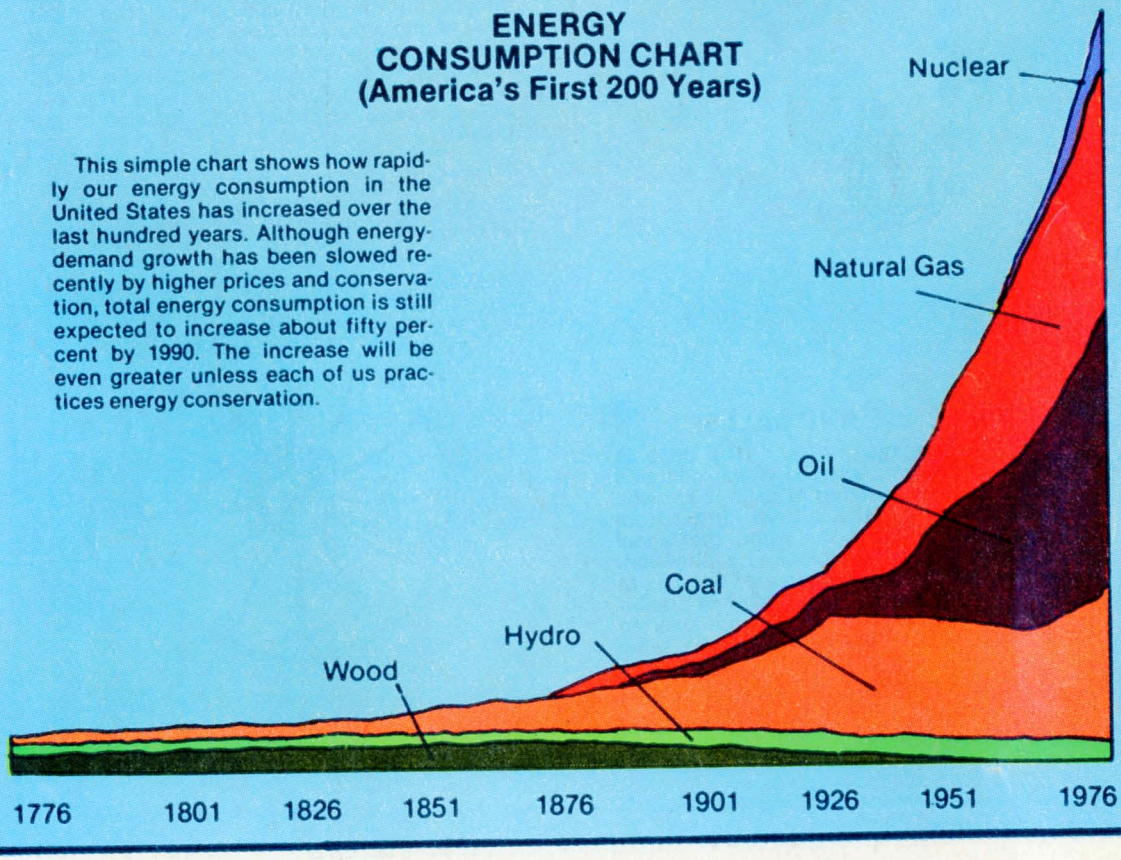


HOW NUCLEAR REACTORS PRODUCE ENERGY

Nuclear physicists produce slow nuclear chain reactions through a special device of nuclear engineering — the famous nuclear reactor. It is an enclosed space filled with atomic fuel, usually uranium, whose atoms are splitting in a carefully controlled chain reaction. A number of different types of nuclear reactors have been built, differing in design and operation, but all having one thing in common — a device to control the speed of the energy-giving chain reaction. The principle of this control device is actually quite simple.



Several chemical elements, among them boron and cadmium, are very efficient as control elements. Their nuclei soak up neutrons as easily as a sponge soaks up raindrops. If rods of cadmium metal, for example, are placed so that they can be extended into or withdrawn from the reactor, they will provide effective control. If these control rods are pushed all the way into the reactor, so many neutrons are absorbed that the chain reaction comes to a complete stop. As the rods are pulled out, and more neutrons stay in the game, the rate of splitting increases, and the reactor gets hotter and hotter. The rods work like the accelerator of a car — or the bridle on a horse.

ENERGY CONSUMPTION CHART (America's First 200 Years)

This simple chart shows how rapidly our energy consumption in the United States has increased over the last hundred years. Although energy-demand growth has been slowed recently by higher prices and conservation, total energy consumption is still expected to increase about fifty percent by 1990. The increase will be even greater unless each of us practices energy conservation.